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WELCOME HOME, P.O.W.s!

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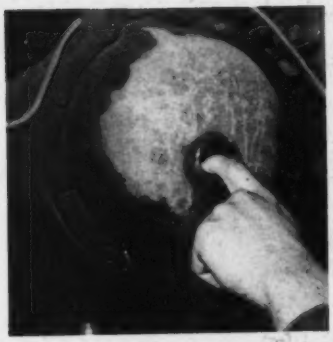
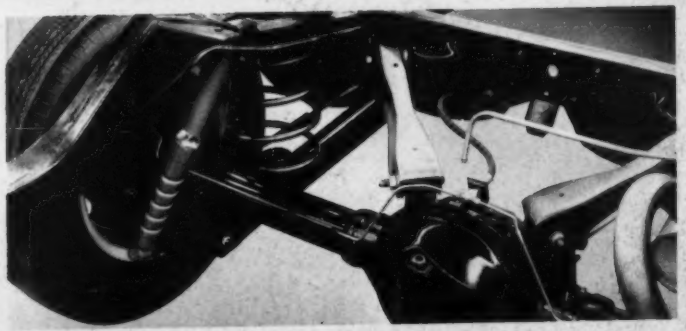
DRIVER

NITTY-GRITTY





DO-IT-YOURSELF
LUBE JOB

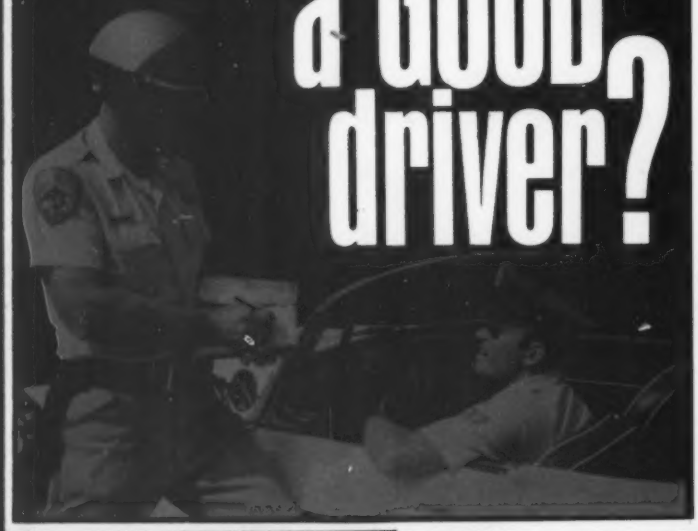
DO-IT-YOURSELF
OIL CHANGE

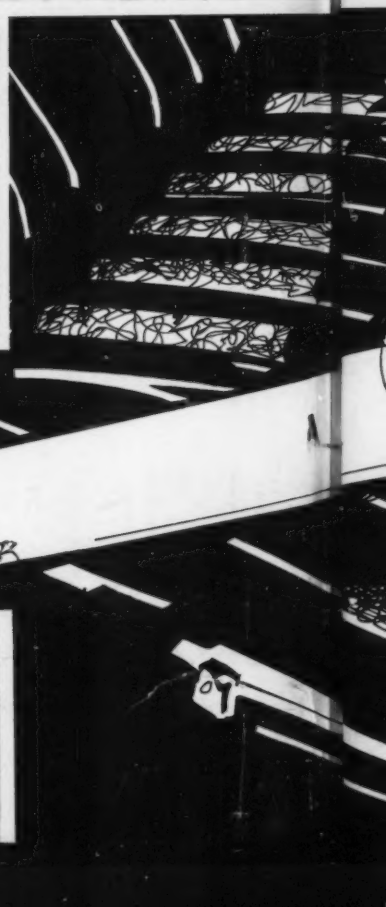
SUSPENSIONS

RADIAL
TIRES

DRIVER

is a YOUNG driver a GOOD driver?





Is the young man a better driver than his elders? He usually has the edge in reflexes and lots of other things that are important to driving. But the statistics say he's not a very good driver. Where does he fall short?

We all carry a few misconceptions around in our heads; little ideas that won't stand up to the cold light of reason.

Sometimes we know the idea is phony and that we're kidding ourselves. "I'm a much safer driver after I've had a few beers, because I concentrate better," says friend Joe. And you nod vaguely, knowing that he doesn't really believe it. But there are other misconceptions that people believe wholeheartedly. "That 'Slow-to-30' sign on this curve is for the average driver, but I can take it fine at 45," says Joe another time. And you feel obliged to explain the elementary laws of physics.

Some misconceptions are accepted almost universally. Ask the next 15 people you meet if a skilled driver is a good driver. If you don't give them too much time to think it over, you'll get 15 "Yes" responses. But if they take time to think about it, they'll see that it's not necessarily so. Example: A nationally-known pro-racer, one of the most highly skilled of all drivers, is frequently mentioned in his hometown newspaper in connection with dinged fenders and speeding tickets. Skilled? You can bet your boots. Good driver? To run around the race track, yes; but to drive you home from the golf course, maybe not. This is not to say that race-driving training and experience does not make good street drivers, since the great majority of racers carry their pride in their trade over to their daily driving. The rare maverick-type racer was given as an example in the extreme to highlight the point that skill alone will not suffice.

One of the noisiest debates ever held in the DRIVER office took place when the morning paper quoted a state DMV official as stating, "Men might as well face it. Women are better drivers." The gist of his statement was that, based on a 3-year statistical study, the percentage of women drivers convicted of traffic offenses or involved in accidents was

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DRIVER

THE
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FOR THE
MILITARY DRIVER

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NEXT MONTH

The U.S. Army's
Air Mobile Motorcyclists

AFRP 127-1

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THE EDITOR SPEAKS

DOUBLE CLUTCH

"PUFFER" PILOTS

In high school we called them "puffers" — scroungy looking cars trailing a characteristic blue-black plume of exhaust smoke. They are still around today on every highway, with rusted multidented fenders, balding tires, wobbling wheels, dangling bumpers, and other signs of neglect.

But authorities have started to learn something about the **drivers** of "puffers." It seems these drivers unwittingly reflect a lot about themselves and their attitudes toward driving; and what they are revealing through their neglect should be heeded by all.

A recent study of drivers and vehicles involved in crashes indicated 65 percent of the drivers had dangerous driving behavior patterns. Most were at fault in the accidents, and half of the 65 percent drove vehicles with subsystems defects judged to be causative. Of the "psychologically normal" drivers making up the remaining 35 percent, only one drove a vehicle judged to be causative in the crash.

One conclusion of the study was, "A man not only drives as he lives, he maintains his car as he lives." My point — if you see a "puffer" driver, give him wide berth; in most cases, his driving approach shares the same neglect as his car. •

WOMEN DRIVERS!

far smaller than the percentage of men drivers.

"Everybody knows statistics are lies!" shouted the Technical Editor.

"Correct," reasoned the Colonel from down the hall, who dropped by to see what the noise was all about. "Women may not have the traffic accidents, but they cause them. Good men drivers are always running off the road trying to get out of their way!"

"So how come teen-age girls pay lower insurance rates than boys?" demanded the distaff side of the editorial staff. "Insurance companies are out to make a dollar, and they aren't emotional about these things."

Some time later, we realized that we had fallen into a word trap. The state official had said that women were better drivers than men, and we had each supplied our own definition of "better." The men were thinking "skillful"; the women, "citation-free." Even the secretary agreed that the average woman is not as expert as the average man at shifting gears, parallel parking, high-speed driving, coping with skids, or a dozen other driving techniques. The more thoughtful male members secretly concluded that the insurance companies might have good reason to offer the ladies lower rates . . . based on the reasoning that they simply (and wisely) don't place such high demands on their more limited driving skills.

Here's another one to mull over. When it comes to driving, does "young" mean "more capable"? It certainly would seem so, for driving depends on all those physical abilities which are at their peak in the young.

Considering the above, why do very young drivers as a group have such awful driving records? Brushing aside the bad attitudes and show-off tendencies of a few, the experts conclude that the fine physical attributes of most young people do not always compensate for a lack of experience and judgment; the more driving experience, the more opportunity to develop judgment. (Note the word, "opportunity." Some drivers never develop good judgment.) The text books tell us judgment outweighs most other factors in driving. Those statistics show there is a definite trend toward improvement in performance with increase in age. Why do older fighter pilots become aces? Because, up to a point, judgment born of experience more than compensates for physical aging.

In discussing age and driving, it's dangerous to generalize about the superior physical condition of youth. The number of years one has lived is chronological age. The degree of deterioration of the body, commonly believed to parallel his chronological

SHOW-OFFS

REACTION TIME

aging, is known as physiological age. Following is a classic driver-education illustration of the amount of disparity there may be between these ages.

A man parked his car at a curb, and his passengers got out. He told them he didn't feel well, and would follow shortly. They returned some time later and found him dead. An autopsy indicated he had suffered a cerebral hemorrhage; the blood vessels in that area were sclerotic, hardened, and he had died a typical old-age death. He was 27.

There are many things we do not know about the process of aging. But next time some little old lady cuts in front of you in her sports car, you'll probably be more correct if you blame it on her lack of judgment rather than her age!

Finally, is it true that fast reactions are essential to good driving? People who work in accident prevention talk a lot about reaction time. How quickly after the driver sees the red light does he get his foot onto the brake pedal? (How quickly after the pilot sees the other aircraft does he take evasive action?) Reaction time can be a fascinating subject for experimentation. Most people react more quickly to sound than to sight. A tactual (touch) stimulus produces a still shorter reaction time in some people. Reaction time varies according to the complexity of the situation and the attention the individual is paying to the stimulus. It varies from individual to individual, and in the same individual at different times and under varying conditions.

With all the talk about reaction time, there is always the unspoken implication: **the quicker the better.** Yet, many traffic safety specialists now say that too high a value has been set on the fast reaction time; because the simple fact is that the fast reaction is not necessarily the

continued

right reaction. Untempered by experience and judgment, the driver may avoid an imminent rear-end collision by swerving into oncoming traffic—straight into a head-on. Another time, he may panic-brake or execute a maneuver that will cause an accident involving the vehicles following him.

So, "skilled plus young plus quick" cannot equal "good driver" without the addition of that fourth ingredient to the formula. With the inclusion of good judgment, the equation comes into balance.

The reason alcohol and drugs have such a devastating impact on our traffic accident experience is precisely because they impair reason and judgment (the higher brain center) some time before they reach the lower brain centers of emotional drives and coordination.

When friend Joe says, **"I can have a few drinks and still drive better than any other man in the squadron,"** it may be alcoholically inspired overconfidence. However, **Joe may be partially right!** When he speaks of driving "better," he means more skillfully. If he is normally a highly skilled, thoroughly experienced driver, his **skill** after a drink or two may still be superior to that of his friends. But his impaired judgment and inhibitions can still get him into trouble. An emotional reaction toward another driver, perhaps sudden anger, meets with no strong inhibitory control by the higher brain centers. Under the influence of even a small amount of alcohol, the normally intelligent Joe responds to the emotional stimulus. He speeds, maybe, or tail-gates, or lane-hops and refuses to yield. And he isn't legally drunk.

Of course, the continued drinking beyond the ounce or two Joe had would also affect the lower centers of his brain. Then his neuromuscular coordination would be poor, his reaction time much slower than normal, and the ability to focus his eyes would be impaired.

Research findings indicate that alcohol may have a marijuana-like effect by interfering with the ability to judge the passage of time. For example, a marijuana user observing an object falling from a table is likely to have the impression that the object is simply floating to the floor. Also, some musicians involved in jam sessions have discovered that marijuana allows them to crowd their drum beats and notes without effort, thus achieving "music" which races along. The phenomenon of incorrect judgment of the passage of time probably accounts for the fact that so many drinking drivers unconsciously drive at excessive speeds.

A car may be a complicated device, but the man behind the wheel is more so. It is important to know as much as you can about the car and how to handle it. But it may be more important to know about yourself, the extent of your skill, the quality of your reactions, the reliability of your judgment. Science can tell you a lot about it; but, ultimately, you'll need to think it through yourself. ●

THE RADIAL REVOLUTION

Radials are basically the safest and best tires going - but they are very expensive, and may not be the best tire for you

A revolution is going on in America—it really started in 1948, in Europe, but it has spread throughout the U.S. during the last couple of years. It's the "Radial Tire Revolution."

Until 1967, U.S. tire makers built only one type of tire; the bias-ply, or conventional tire, and the belted-bias tire followed shortly afterward. Radials have long been the tire in Europe; but until recently, they were something only the hardened sports-car "freaks" in the U.S. knew anything about.

During the last 2 years, however, "radial" has become a household word. Most new cars are available with radials as an option, or as standard equipment. And, most car owners at least consider these tires when it comes time for new treads. Many people, however, don't really know what a radial is, and whether it's any better than the other two basic tire types.

WHAT IS A RADIAL?

"Radial" actually refers to the tire's construction (the way the ply layers are arranged in the tire carcass). A radial-tire body is made of cords which run from one rim-edge to the other in "hoop" fashion (Fig. 1). The advantage is that such body plies are better able to cushion the tire and absorb vertical movement, since they are placed radially and run perpendicular to the ground contact area (Fig. 2).

The use of "hooped," or radial body plies, gives the tire's sidewall great flexibility, increasing shock absorption. This shock-absorber effect reduces road friction, thereby increasing the tire's ability to dissipate heat. Heat accelerates tread wear, and causes tread separation and blowout; so a radial tire can outlast any other tire by simply running cooler.

RADIALS GRIP THE ROAD

Heavy ply belts run around the outside of the body plies—under the tread layer, bracing the tread and keeping it from moving when the tire is stressed (Fig. 2). These belts are made of fiber glass, steel wire, or tough cord material. They give additional strength to the tread, and keep it flat on the pavement when the sidewalls flex during cornering

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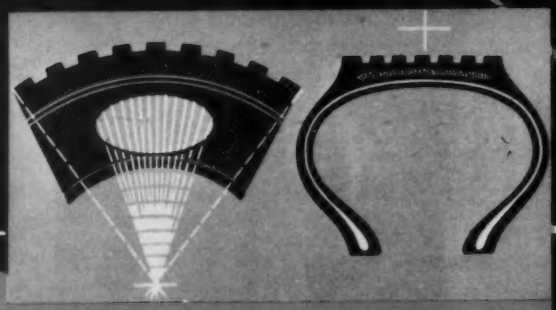


Fig. 1 Radial construction.

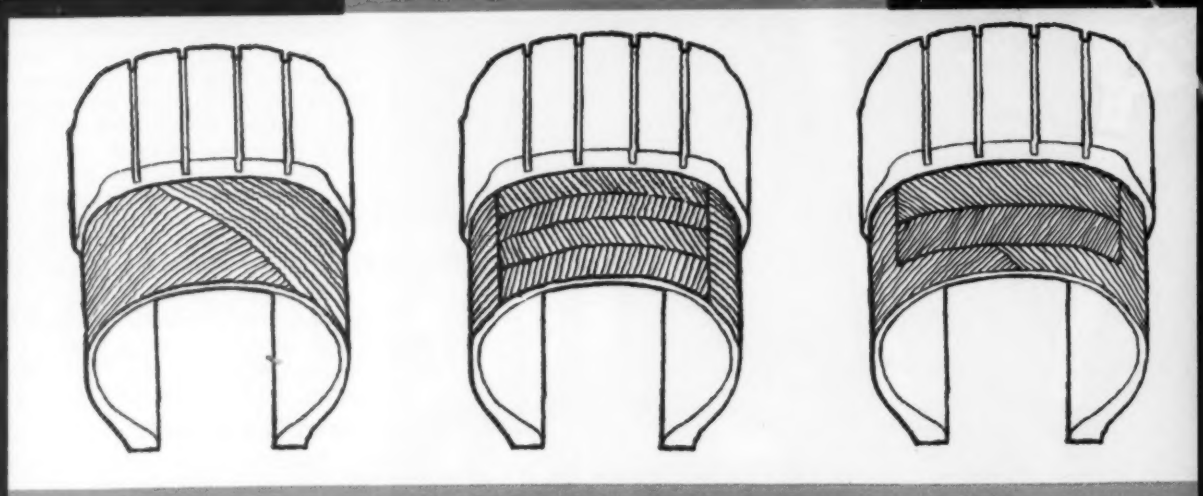


Fig. 2 Tire types—conventional bias-ply (left), radial (center), and belted bias-ply (right).

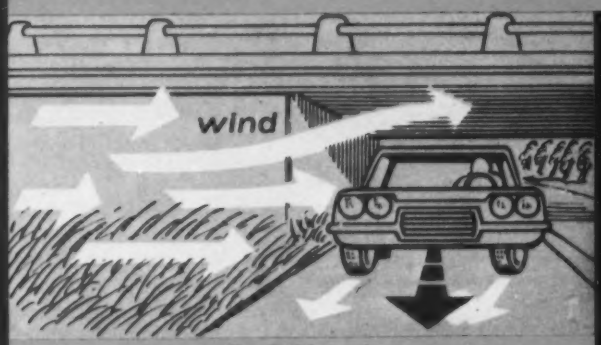


Fig. 3 Slip-angle.

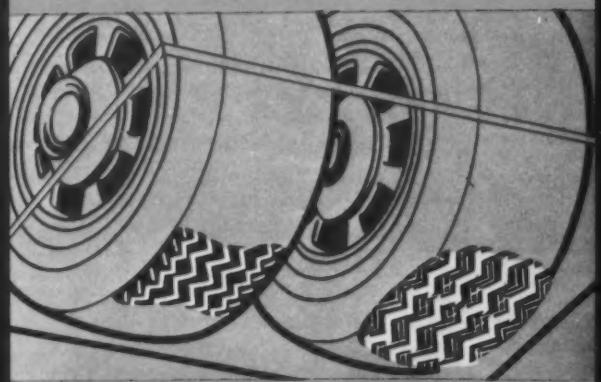
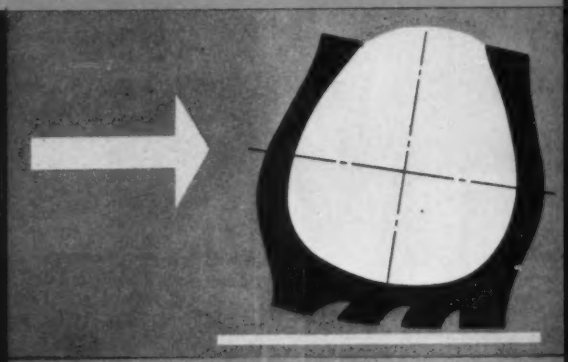


Fig. 5 "Footprint" difference—
conventional bias-ply (left), and radial.



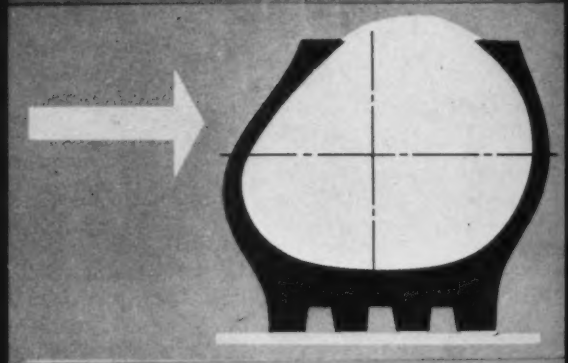
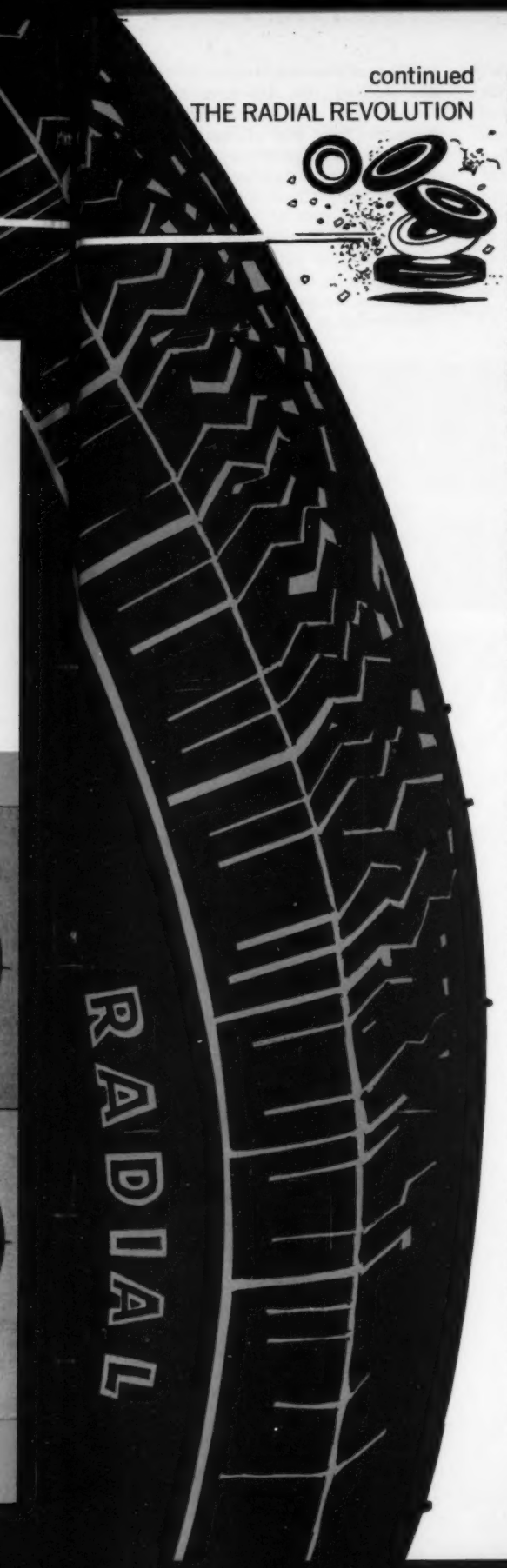


Fig. 4 "Curve-grip" difference—
conventional bias-ply (top), and radial (bottom).



or braking. This is what gives the radial its famed ability to grip the road under all conditions.

SLIP-ANGLE?

The most constant and most noticeable effect of the radial's gripping ability is its precise tracking on the road. For instance, with no side wind or road slope, the line of travel and direction in which a vehicle's wheels point are identical. Add a strong wind from the right, and the car has to be counter-steered slightly to the right to continue going straight. This creates an angle, between the car's line of travel and the direction the front tires point, known as the "slip-angle" (Fig. 3). This angle is even greater when a vehicle is cornering.

Because of its ability to flex and keep the tread surface on the road, a radial tire (especially a steel-belted radial) reduces the slip-angle as much as one half. Compared with a radial-equipped vehicle, one equipped with conventional tires is doubly vulnerable to anti-steering forces. With radials you have more accurate steering, and your car is less affected by wind—you simply have more complete control of your car.

UNSURPASSED TRACTION

Along with better steering control, radials offer unsurpassed traction when cornering and stopping. When the usual side forces are applied to a conventional tire in a corner, the stiff sidewalls cause part or all of the tread to squirm, or even lift off the road (Fig. 4). The radial's flexible sidewalls, however, absorb the side forces in a corner and leave the entire tread surface flat on the road for maximum traction and safety. The same is true when stopping or accelerating; a radial puts a larger "footprint" on the road than any other tire (Fig. 5). This is why chains are not as necessary as with conventional tires when driving on slick surfaces.

UNBELIEVABLE TIRE MILEAGE AND MPG

In addition to the major advantages of road stability and unsurpassed traction, the radial offers several other safety and economic features. Because of their exceptionally strong tread and ability to run cool, most radials are guaranteed for 40,000 to 50,000 miles, with tread life approaching 75,000 miles not being unusual. The radial's strength and resistance to heat also virtually eliminate blow-outs.

Another feature which helps make the radial the best tire value on a cost-per-mile basis is its low rolling resistance that boosts gas mileage as much as 3 mpg over conventional tires.

Further comparison of the radial with the other two tire types will reveal even more advantages of radial construction.

BIAS-PLY

The oldest, and still the most widely used tire in the U.S., is the bias-ply, or conventional-ply tire. The term, "bias," simply means the plies or layers of cord are crisscrossed from one rim-edge to the other (Fig. 2). The bias-ply's main advantage is economy of manufacture. Being the least expensive to make, it can be sold for less, but the bias-ply tire is most prone to failure. It also gives the least mileage, with the highest cost-per-mile. This is because thick ply layers must be used to give it the required strength. These thick, criss-crossed plies cannot flex easily when stressed. When a side force is applied, as in cornering, the crisscrossed cords pull at different angles. This generates excess heat and causes tread squirm. Heat and tread squirm are the major causes of tread wear; so, conventional tires wear quickly—especially when given hard use. Another reason they run much hotter than radials, under normal conditions, is because the non-flexing sidewalls create more friction with the road, and they cannot dissipate heat easily.

BELTED

The newest of all tire types is the belted bias-ply. It has body plies arranged in the same manner as a conventional tire, but also has belts of tread ply added on top of the body ply (Fig. 2). These belts are similar to those used in radial tires, and are usually made of fiber glass or steel cord. The belted tire offers puncture resistance, better handling characteristics, cooler running temperatures, and resulting tread mileage approaching that of a radial.

HAPPY MEDIUM?

Because of its strength, traction, mileage, and initial cost (and cost-per-mile), between that of the conventional tire and the expensive radial, the belted tire has become a popular happy-medium tire in recent years.

Belted tires have suffered from a few problems in the past, such as out-of-roundness, tread separation, and poor mileage. These problems, however, have been largely eliminated; the newer belted tires, especially the steel-belted models, have qualities greatly exceeding the older types.

continued on page 23

Diagrams, Figs. 1, 3, 4, and 5, courtesy Michelin Tire Corporation.

"Pride in the Past . . . Faith in the Future," "Find Yourself in the Air Force" — you've probably heard 'em before, but have you ever seen these slogans plastered on a 1600-horsepower Funny Car?

A DRAG RACING Recruiter?

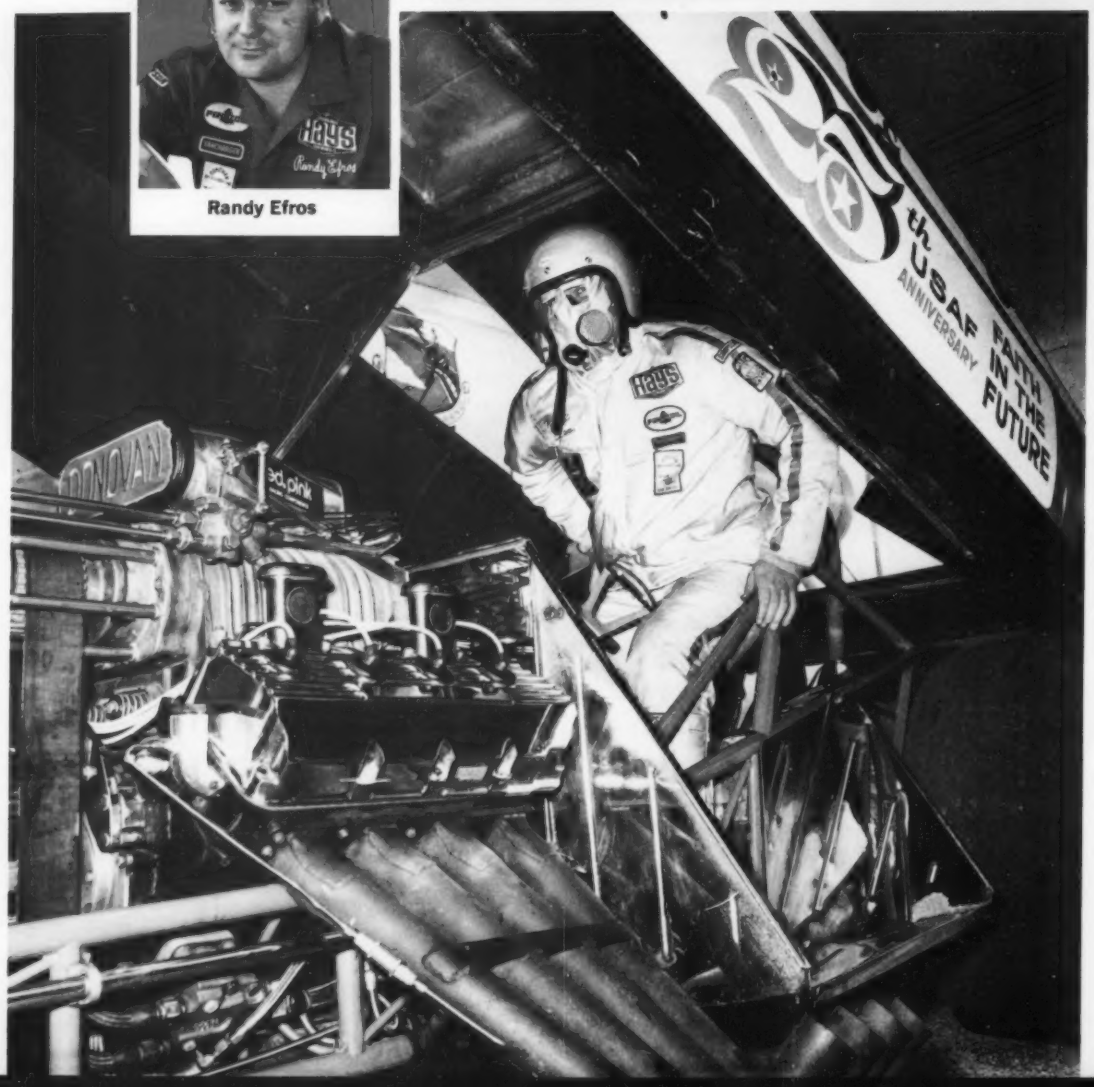
"The best part of drag racing is it's one of the few sports where the spectator can really get involved —especially on the mechanical end of things," suggested Randy Efros while unloading his 25th USAF Anniversary Funny Car* during a recent visit to Norton AFB, Calif.

**Funny Car is a type of dragster which employs an altered frame and high-output engine that burns exotic fuels—but has a lightened replica body that resembles an average production car.*

Efros, of Phoenix, Ariz, is the owner-mechanic of the Air Force-sloganed Funny Car, as well as a 25th USAF Anniversary Top Fuel Dragster. These cars have campaigned very successfully on Phoenix area strips, and both are the Arizona State Champions in their respective classes.

The Funny Car develops 1600 horsepower from a 426-cid hemi engine; rather potent when matched with a chassis that weighs a mere 1900 pounds —the fiberglass body totaling only 200

Randy Efros



of these pounds. The car turns times in the 6.80-second bracket, with speeds reaching 215 mph for the quarter mile —good enough for the track record at Tucson, Ariz, although Efros believes the car is capable of much quicker times.

Efros continued his thoughts on drag racing:

"At the drags, people can come down to the pits and watch us work, and talk to us. If they have any questions on mechanics or safety, we can usually answer them—and hopefully he or she will pick up some important tips."

SUPER-MECHANIC SUPER RECRUITER?

The 26-year-old super-mechanic can give plenty of mechanical tips based on his 10 years in drag racing. Lately, however, Efros has been giving a lot of tips on assorted subjects. He has become associated with the USAF Recruiting Service in Phoenix—hence the slogans, "Pride in the Past . . . Faith in the Future," "Go Air Force," "Fighter Pilots Do It Better," and others on his cars.

This association has the articulate mechanic on the road transporting one of his cars nearly every day. His schedule centers around presentations at Phoenix area schools in cooperation with USAF recruiting programs, but he also displays the cars at auto shows. He took part in the Air Force display at the Arizona State Fair, and has done demonstration runs at Williams AFB, Ariz, and Cannon AFB, NMex.

SCHOOL PRESENTATIONS

Randy likes the school presentations best, however. "I've always been a nut on proper mechanical procedures and safe practices, and this gives us a chance to get the right information to the younger people," he said. "We give a rundown on the car and its safety equipment, and then the kids look it over and ask questions. The car's safety systems and our presentation make a very favorable impression on the kids. You can tell by the questions they ask," he added.

MECHANIC'S TIPS

Randy talked a little racing and a lot of mechanics with DRIVER during his Norton visit:

"Our engines can last an entire season with the proper maintenance—if we don't have a metal failure in a vital part. An entire season on the drag circuit is like a lifetime for a normal car—people should realize how much money and trouble they can save by maintaining their street cars properly.

"We tear down the car completely after each race meet, and check every nut and bolt. This is essential. Mechanical preparation is what makes a winning car—just as proper maintenance is essential to a good-running street car.

"One of the most important things I've learned about working on cars is to be clean and orderly. I always use a checklist when disassembling any part. I have—and I know most everyone has had that sick feeling of reassembling a part, then suddenly discovering a bolt had been left out, and not having the slightest idea of where it belonged. I avoid this by using a checklist for every job, and making diagrams of parts removed."

SAFETY EQUIPMENT

Randy paused while he flipped up the car's body:

"Of course we inspect all the safety systems before the driver ever gets into the car. The car is built with a complete roll cage, a highly resistant fire wall, and an automatic fire-extinguishing system. The driver wears the best helmet, a fire-proofed suit, and a fume mask, and is belted in securely. Not many people have that much equipment protecting them on the freeway—hopefully they're not going 200 mph. But it's just as important for you to use the safety equipment provided in your car as it is for the race driver. The stuff is there for a purpose—just like it is in our dragsters.

"My advice to those interested in racing is to get together with some guys and build a car for the track. Too many people make the mistake of building a street-racer. Even if they don't race on the street, these cars are often dangerous. It's like they always say, 'What's good for the track isn't necessarily good for the street.' This is especially true in the way of suspension modifications. Mods might make the car look 'cool,' and even give the desired traction increase—but it probably won't handle right. Dragsters aren't made to turn—and in a lot of street driving you're turning more than you're going straight.

"There are a lot of great safety improvements that originated through racing, and carried over to Detroit. Modifications such as heavy-duty suspensions and disc brakes are some of the obvious improvements. Other things we do to keep our cars running right, such as frequent oil and filter changes, keeping the engine finely tuned, and making adjustments for changing operating conditions, are also advisable for the average driver.

"For safety, as well as other reasons, you should keep street-cars as stock as possible, maintain them properly, and drive them sensibly. If you want to race—get the right equipment, and do it on the track."

LOOK HIM UP

This isn't all the friendly and informative Randy Efros has to say about drag racing, however. Next time you're at the strip and a chute carrying the advice, "Go Air Force," pops at the end of the quarter mile—you'll know Randy is somewhere in the pits, just waiting to talk racing, mechanics, or even Air Force.

You might even look for the chute at some of the big meets this coming season. Randy is in the process of building a new car, and hopes to hit the national circuit in between his Air Force "recruiting" engagements. ●

The 200-pound stock-looking fiberglass body of the 25th USAF Anniversary Funny Car flips up to reveal a not-so-stock 1600-hp 426-cid hemi engine. The giant power plant leaves little room for the driver to squeeze into his roll cage-protected cockpit. The driver must wear a fireproofed suit, helmet, and the strange-looking mask which protects him from the lethal fumes of the nitro-methane fuel.

What about a PROPANE car?

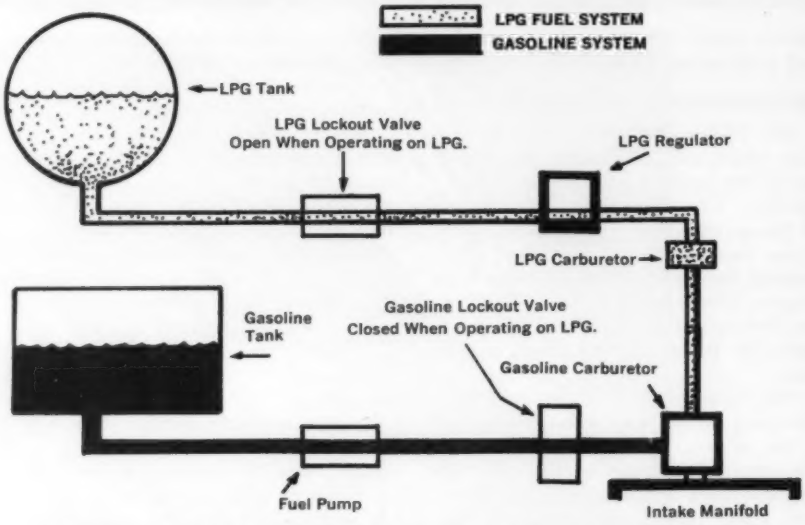
In the near future you may find an interesting fuel option available on new and used cars. It won't give you a more powerful engine, but will offer cheaper, cleaner operation with much lower emissions. The fuel option may be either liquid propane (LPG) or hydrogen gas (H_2).

Numerous LPG-fueled vehicles are already on the highways, and hydrogen-fueled vehicles are on the way. Several major auto companies are running extensive tests on both systems. A number of universities also are experimenting with and testing these and other types of low-emission vehicles. UCLA, for one, has assigned a student engineering team to study the feasibility of the hydrogen power system.

One conversion firm in southern California has converted more than 100 cars to LPG-fuel, in addition to numerous truck fleet conversions. The conversion business is growing at a steady rate as greater numbers of drivers and fleet operators become more keenly aware of their part in the air-pollution battle.

Reasons for these conversions, other than effecting long-range dollar savings, are simple: air pollution and the growing energy crisis in this country. Solutions to these problems must be found. Hydrogen-fuel shows promise in all these areas, especially in the energy field, for it does not deplete a natural resource (petroleum) as does LPG.

LPG-GASOLINE DUAL FUEL SYSTEM



A diagram of a typical dual-fuel hook-up. This system is not often used on private vehicles, but has some application in the commercial vehicle field.

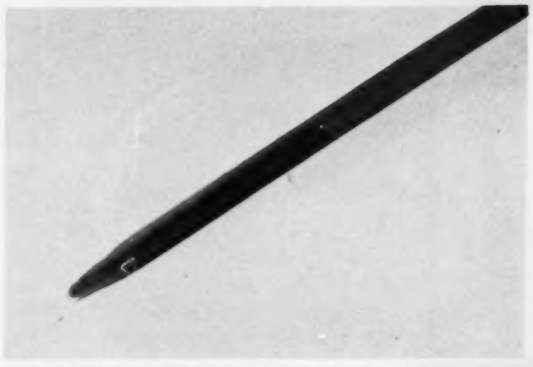
Both LPG and hydrogen gas fuels have advantages over gasoline, both have some disadvantages. In a later issue we will present information on hydrogen; meanwhile, some information on the propane system.

Propane is the same gas used for heating and cooking in trailers, campers, and many rural buildings. At present, one of its biggest disadvantages is the conversion cost to the motorist. The price of converting an auto or a pickup can run as high as $600. Fleet conversion brings the cost down to around $450. Another disadvantage is that propane is a by-product of the petroleum refining process, and the world's supplies of crude oil are limited. Also, at this time, the nationwide availability of propane gas is not equal to that of gasoline. It is readily available in California, however, with state tax breaks for users.

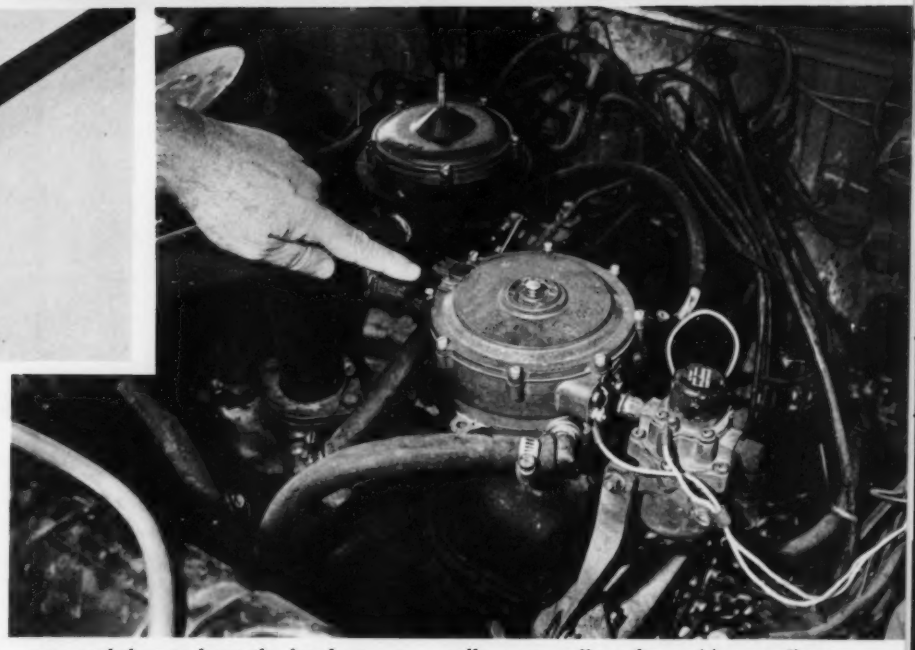
Some LPG conversions are known as dual-fuel conversions, and you can switch from LPG to gasoline whenever you like. However, with dual-fuel you cannot tune your engine to LPG standards, so your mileage suffers when running on LPG.

An LPG conversion consists of a pressure tank, a regulator, and an LPG carburetor on the intake manifold. The regulator is water-jacketed and the hot water helps convert the

Propane fuel users are proud of their part in the anti-pollution battle, as this sign on a converted pickup truck indicates.



Clean oil is a major advantage of using LPG. This dipstick from a Dodge pickup shows the clarity of the motor oil. No deposits are evident and the fleet operator never changes the oil, only adds it as required.



Water lines to and from the engine block show in this view of the propane regulator valve. The valve converts the liquid fuel to a gas before it reaches the carburetor. Hot water assists the conversion.

liquid propane to a gas. Mixing two gases (propane and air) is easier than mixing one gas (air) and one liquid (gasoline). The LPG/air mixture burns more completely than the gasoline/air mixture.

MONEY-SAVERS

An area fleet operator from Yucaipa, California, told DRIVER he converted his Dodge pick-up trucks 2 years ago and has never regretted it. The trucks had been driven about 20,000 miles when the change was made. Since then, each has run about 40,000 miles on propane.

The operator said that, after the initial oil change, he has never had to change oil. He adds only a quart now and then to keep the level up—a definite savings. Nor has he had to change oil filters . . . more savings.

He says the engines are "clean as a whistle, inside, where it counts. No gunk or gook on the valve lifters, and no carbon on the valves or heads." He expects to double or triple the engine life of his pickups.

Another fleet operator who runs five LPG-fueled auto tow trucks told DRIVER he expects at least one-and-a-half times the normal engine life from his trucks.

Mileage figures vary from user to user, just as does gasoline mileage. One fleet operator claims his LPG mileage has dropped about one-half mile per gallon from his gasoline mileage. Another says he gets about one mile per gallon less on LPG than he did on gasoline. Power losses are not excessive in any reported conversion. Acceleration rates are as good or slightly better than on gasoline, DRIVER was told.

All prospective LPG users are urged by conversion experts to put at least 5,000 gasoline miles on their vehicles before making the change. Otherwise, they say, valves and rings will not seat properly and any LPG advantages will be lost.

continued

This vertically mounted, 40-gallon propane tank is used on a tow truck. Shown is the filler connection.

The propane carburetor replaces the gasoline carburetor on top of the intake manifold of a Dodge pickup.

continued

WHAT ABOUT A PROPANE CAR?

TAX SAVINGS

Premium gas runs as high as 47 cents a gallon in southern California. With a California Air Resources Board-approved LPG conversion, users are exempt until 1975 from the California state sales tax on propane as well as another 7-cents-per-gallon tax. There is a bill in the California state legislature which, if passed, will exempt until 1980 approved LPG conversions from the state road tax, weight fees, and licensing fees.

LOWER EMISSIONS

Liquid propane gas-fueled vehicles emit about 50 percent less reactive hydrocarbons than gasoline engines. The hydrocarbons they do emit have a much lower reactivity than those from gasoline engines. In short, it takes longer for sunlight to convert the LPG hydrocarbons to photochemical smog. Also, less air movement (wind) is necessary to disperse the smaller amounts of LPG emissions before they become smog.

Unlike many owners of gasoline-fueled cars equipped with emission-control devices, the LPG users report no particular engine-start problems. No warm-up period is needed, and engine tuneups are less frequent.

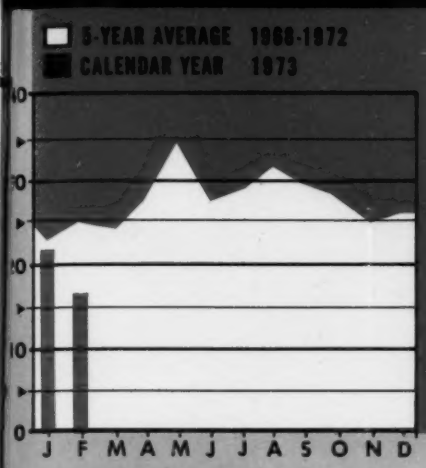
Vehicles converted to LPG fuel are under government study as well. The General Services Administration (GSA) is testing a fleet of LPG vehicles. The Air Force is awaiting the test results and may eventually adapt the system for certain ground vehicles.

SOME PRECAUTIONS

Propane gas users claim their vehicles are as safe as the gasoline-powered vehicle. LPG tanks must meet SAE pressure standards, and an odorizer has been added to the propane to help detect leaks.

Adequate venting of the LPG tank is a must. Propane gas is 1.5 times heavier than air and if the LPG tank leaks, the gas will settle to the bottom of the trunk and create a hazard. Your best bet is to insure the tank area is fully ventilated to prevent any such accumulation. Periodic checks on the lines, valves, and fittings should also be made. Use soapy water, not a match! Keep the valves and regulator clean, and see that the tank is securely mounted.

Any way you look at it, the LPG conversion is an interesting approach to the air pollution problem confronting us all. ●



TOTAL FATALITIES as of 28 FEB:

CY 1973: 39

5-YEAR AVERAGE: 48

A monthly recap of selected accidents—presented solely in the hope some will benefit from the unfortunate experiences of others

HOW GOES IT?

BALD AND MIXED TIRES

Rank: Sgt/Sgt Type vehicles: 1969 Ford 2-door/PMV, type unk

A Sgt lost control of his Mustang at 0005, after spending some time at a bar. He was driving on a bald right rear tire, and failed to reduce speed prior to attempting to negotiate a sharp right-hand curve. The bald tire broke traction and the unrestrained Sgt was ejected and killed.

Another Sgt lost control of his car at high speed, before dawn on a gravel road, when the right rear tire blew. The intact rear tire was an oval slick, and the others were conventional types. The vehicle left the road and rolled over, ejecting the driver and his three young civilian passengers, and came to rest on top of the Sgt. The three civilians were seriously injured, and the Sgt was killed. Seat belts were not in use.

Primary cause: Loss of control while speeding.

Contributing factors: In one case, alcohol, mismatched tires, and blowout; in the other case, bald tire; in both cases, fatigue and minimized control due to not being buckled in.

ASLEEP AT THE WHEEL

Rank: MSgt/Sgt Type vehicles: 1971 Honda Coupe/PMV, type unk

A MSgt nodded at the wheel at 0415, and his Honda angled onto the shoulder. The tiny car rolled end-over-end when the driver awoke and overcorrected, and his unbelted Amn passenger was thrown through the windshield and killed. The MSgt, who was wearing his seat belt, received minor lip and forehead injuries.

A Sgt, who had been drinking heavily, dozed at the wheel at 0215. The vehicle's left front door impacted a bridge abutment, and the driver was killed. He was not wearing his seat belt, but investigators doubted it would have helped in this instance.

Primary cause: Sleeping while driving.

Contributing factors: In one case, heavy drinking; in both cases, fatigue.

TRAINS DON'T BUDGE

Rank: Sgt/Sgt Type vehicles: 1962 Chevrolet 2-door/1966 VW Sedan

It was dark, and the road was wet when a Sgt drove a borrowed Nova across the solid, double centerline, around a line of cars waiting for an approaching train to pass, and partly onto the tracks.

The crossing was marked by a conventional RR-CROSSING sign, and the red warning lights were flashing. The driver attempted to turn back into the right-hand lane to avoid the stopped opposing traffic, but was ejected and killed when the train impacted the car.

Another Sgt was riding in the rear seat of a civilian's VW when the driver disregarded STOP and RR-CROSSING signs and drove onto the tracks. A train crashed into the left rear end of the car, killing the two civilians in the front seat as well as the Sgt.

Primary cause: Driving into path of oncoming train.

Contributing factor: Failure to stop at posted RR crossing.

WEIRD WINDS

Rank: A1C/SSgt Type vehicles: 1971 Honda motorcycle, 350cc/1972 MGB-GT 2-door

An A1C rode his motorcycle in excess of the posted 65-mph speed limit in a 24-mph wind gusting to 34 mph.

The bike departed the roadway and struck an access road embankment. The impact ejected the rider for 155 feet, and he died 6 days later.

A SSgt was completing a passing maneuver in a windy tree-lined area. As he started to turn back into his original lane, his MGB moved out from the protection of the trees and veered off the road. The vehicle struck a tree stump and turned over several times, ejecting and killing the unbelted driver.

Probable causes: The cyclist may have lost control when the wind, into which he was leaning his bike, suddenly died down; the MGB driver may have oversteered when struck by a blast of wind as he left the protection of the trees.

Possible contributing factors: The MGB driver's not being buckled in may have affected control; in both cases, speed was too fast for driving in high winds.

Race-car driver and former member of Trans-Am pit crew for racer Lee Midgely offers some sage advice on the mechanics and handling of vehicle suspensions*

*Our readers first met the author in "The Lieutenant and the Trans-Am," Dec '71 DRIVER.

HOW TO HANDLE SUSPENSI

by Lieutenant Larry Randlett

Five hundred horsepower! That's what Don had stuffed under the hood of his 427 Corvette. Five hundred honest-to-goodness, romping, over-engineered Percherons (at about $4 per horsepower)—but he was still 5 seconds off the pace at Riverside, and the race was tomorrow.

Meanwhile, Lee was taking our Cobra around the course at record speeds with only 400 hp from his 289-cubic-inch engine.

Later that afternoon, Don came over to me while I was adjusting the Cobra's valves. "I just can't understand it," he said. "I spend three times as much money as you, but your car is always faster than mine. I can't understand it, I just don't know . . . ."

The preceding incident took place at Riverside International Raceway several years ago, and to this day I'm sure Don doesn't know why we were so much faster. His car had more horsepower than anyone's, but he had so misadjusted the suspension that the power could not be effectively transmitted to the road. In fact, Don had made so many changes to the suspension, his car handled worse than when it was stock. This series of articles on suspensions can help keep you from making the same mistakes Don made.

WHY SUSPENSIONS?

Any motorist will attest to the fact that American roads are anything but perfectly smooth. They consist of ruts, bumps, holes, undulations, and inconsistencies that make suspensions a necessity. If cars didn't have suspensions, every bump would bounce the wheels free of the road surface, with no force but gravity to bring them back in contact. The car would be all but impossible to steer, and any progress made would be slow.

WHAT ARE SUSPENSIONS?

Suspensions are more than springs and shock absorbers. They are A-arms, links, traction bars, sway bars, shock absorbers, and all those little bits and pieces that help keep the car in contact with the road.

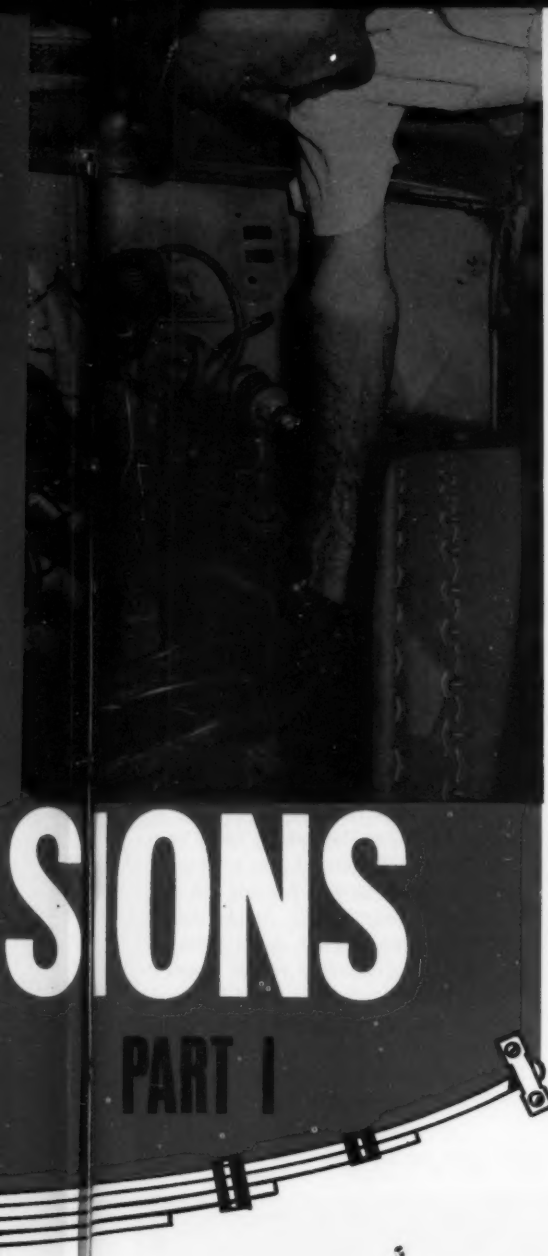
The suspension is designed to keep the rolling wheels in a predetermined relationship between the road and chassis each time the car strikes a road irregularity. As the tire bounces upward, the spring pushes the wheel back onto the road. The shock absorbers are responsible for damping the harmonics of the vibrating springs. A-arms allow the wheel to move without necessitating a major movement of the entire automobile; they also dictate the geometry or lines of motion of the wheels.

SUSPENSION TYPES

There are two basic types of suspensions; live and independent. Live suspensions are solid-axle suspensions. In this type, much of the upward and downward movement of one wheel is transmitted to the juxtapositioned wheel. The independent suspension, as the name implies, allows movement of one wheel without affecting its opposite number.

Within these two classifications are a number of variations. The most common type of solid-axle rear suspension is the Hotchkiss drive. The axle is sprung by two semi-elliptic leaf springs, mounted longitudinally, attached to the chassis (Fig. 1). This type of suspension is very inexpensive to construct; hence, its popularity with Detroit's economy-minded engineers.

The Hotchkiss drive allows for no



SIONS

PART I

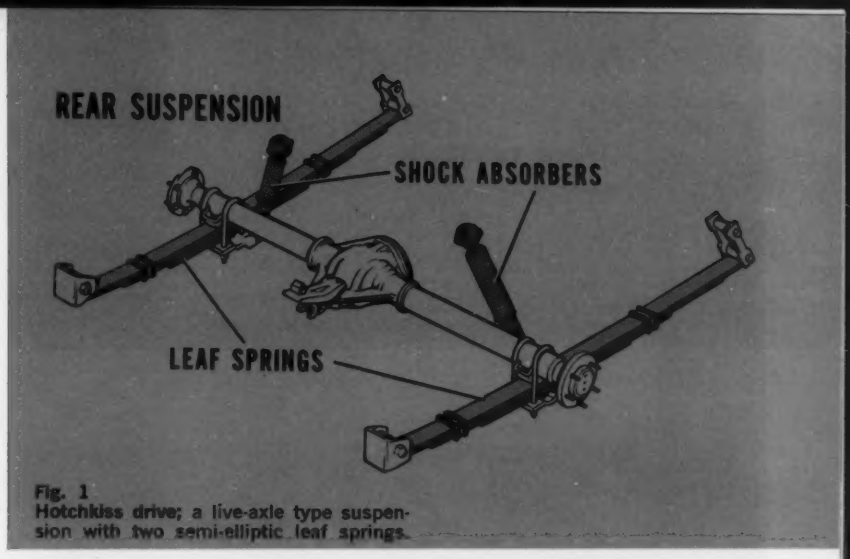


Fig. 1
Hotchkiss drive; a live-axle type suspension with two semi-elliptic leaf springs.

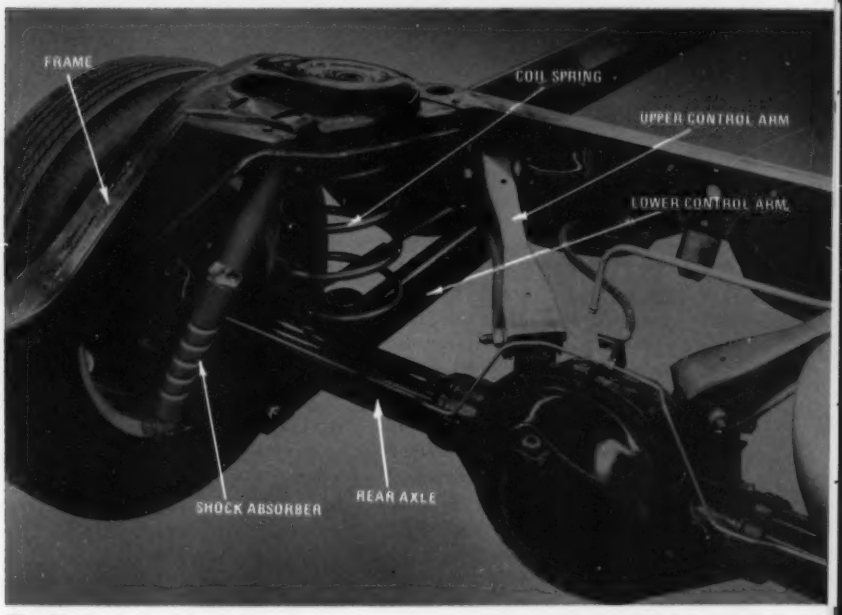


Fig. 2
Coil-spring rear suspension; also a live-axle suspension, but with coil springs and trailing links.

camber changes during cornering, giving it the advantage of predictability of behavior over other suspensions.

A variation of the live axle replaces the leaf springs with coils and trailing links (Fig. 2). This type of suspension is one of 10 found on large American sedans. The coil springs allow for less innerspring friction, providing a smoother ride than the Hotchkiss drive delivers.

One of the major disadvantages of the Hotchkiss drive and coil spring arrangements is "axle windup." This results when a large amount of torque is transmitted to the differential. Springs present very little resistance along the longitudinal axis of the car. As a result, the axle winds up about its centerline (Fig. 3). This can cause the rear wheels to hop as the axle winds and unwinds. To counter this, some cars are equipped with trailing arms, or traction bars (Fig. 4). These bars allow movement of the axle up and down; but one wheel alone cannot leave the road surface, and the axle cannot wind up. There is an important warning associated with this modification. *Traction bars change handling significantly; the car tends to spin out in a corner.*

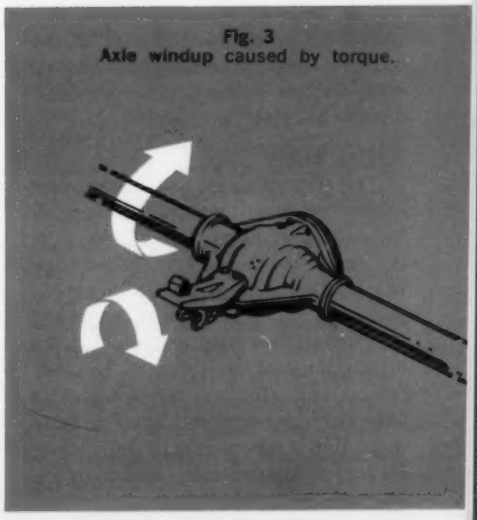


Fig. 3
Axle windup caused by torque.

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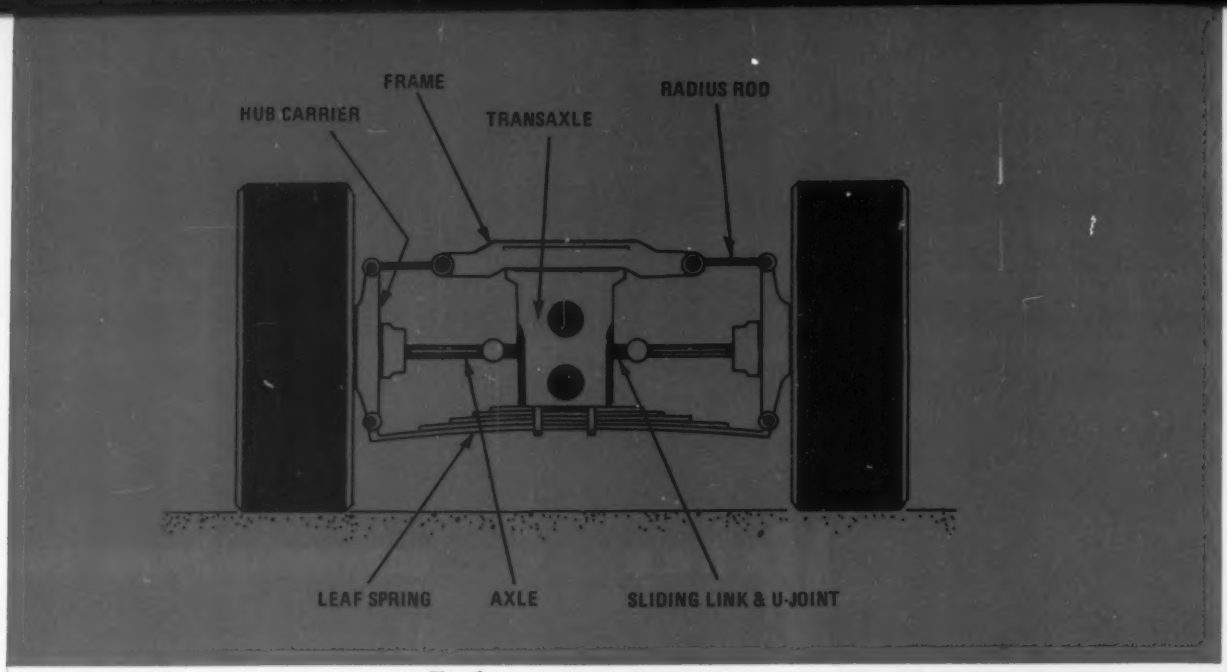


Fig. 4
Independent rear suspension, found on most high-performance sports cars. Allows movement of one wheel without affecting the other half of the suspension.

continued

HOW TO HANDLE SUSPENSIONS

Independent rear suspensions (IRS) are generally characterized by universal joints that allow each half-shaft (one-half axle) to move without affecting the remainder of the suspension (Fig 5). This allows one wheel to hit a bump without reducing the tire/road contact of the other wheel.

A feature of many independent rear-suspension units shared with front suspensions are unequal-length A-arms. These are two lateral locating arms for each wheel (Fig. 6). They are of unequal length to control camber change during cornering. The change favors the camber of the outside wheel as opposed to that on the inside during cornering; but, like so many factors relating to suspensions, this is a necessary compromise.

VEHICLE WEIGHT

The greatest single consideration in suspension design is vehicle weight. A heavier car requires a greater cornering force than a lighter vehicle. In heavy cars this is usually compensated for by use of wider tires, but they are seldom large enough to make up for the increased weight. In addition, a car (like any other body) is subject to gravitational laws; a body in motion tends to remain in motion. Hence, a heavier car requires more effort to change direction.

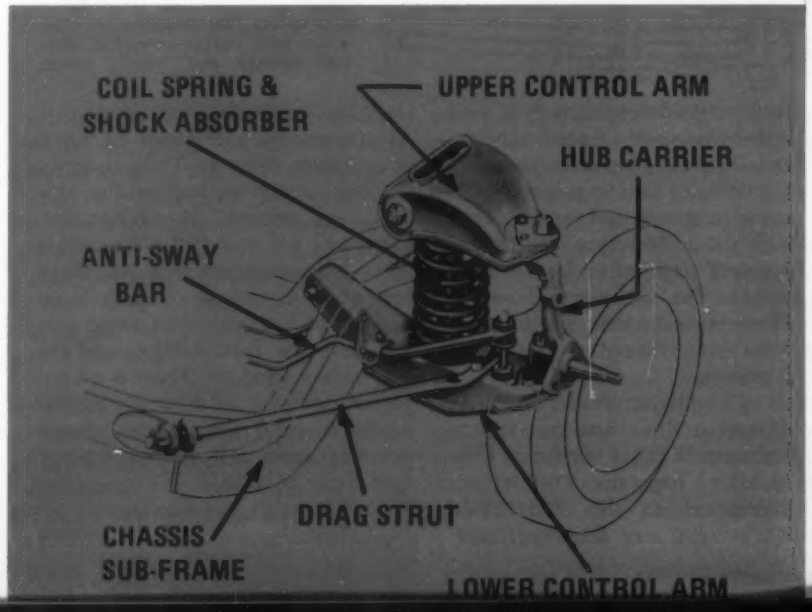
WEIGHT TRANSFER

As a car goes around a corner, weight is transferred from the inside wheels to those on the outside. This weight transfer changes the load on the two sets of wheels with a resultant traction loss on the inside tires. Obviously, the less weight transferred, the better the handling. There is little the amateur car enthusiast can do about this transfer, since removing weight is seldom practical. The professionals try everything to reduce weight, from replacing glass with light plastic to "acid dipping" of vehicle bodies.

CENTER OF GRAVITY

The height of the car or, more specifically, the height of the center of gravity, has a strong bearing on the way a car corners. This height determines the amount of weight transferred from the inside to the outside tires. Theoretically, the ideal location for the center of gravity would be ground level, halfway between the axles on the car's center-line. Thus located, there would be no weight

Fig. 5
Unequal-length A-Arms; characteristic of most front suspensions and independent rear suspensions.



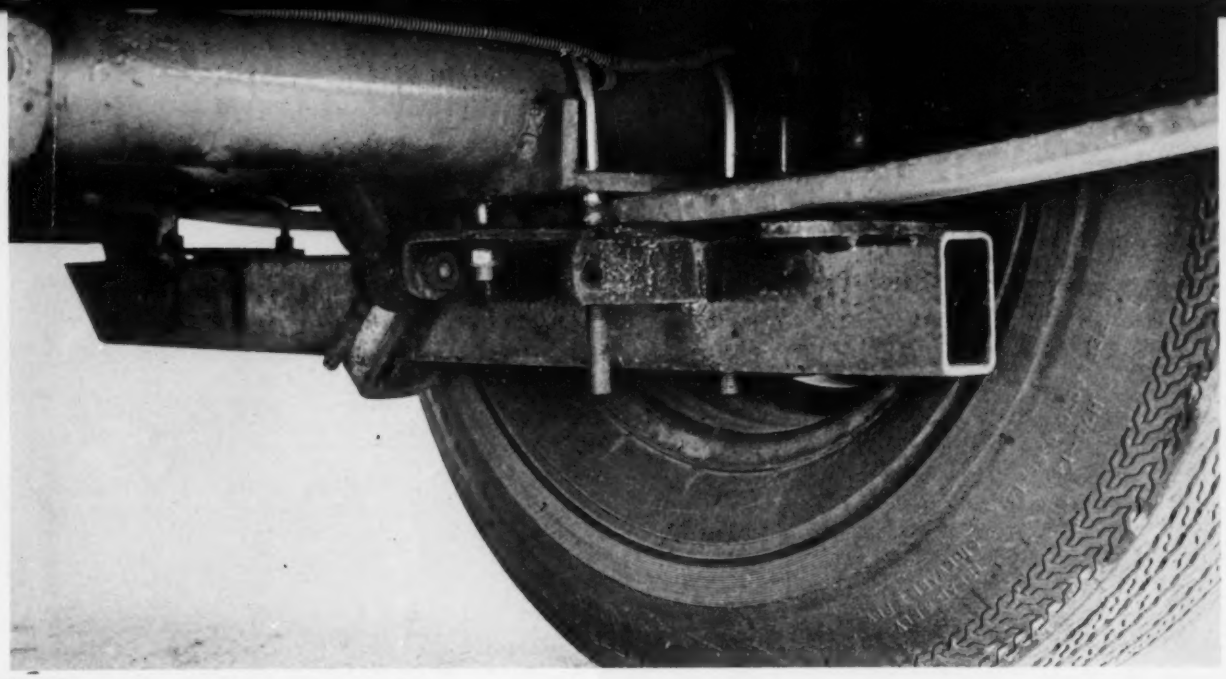


Fig. 6
Traction bars control wheel hop caused by axle windup. Can cause a car to spin out in a corner.

transfer at all. However, the center of gravity must be located somewhere in the mass of the vehicle; therefore, it is often well above ground level. The center of gravity should be placed as close to the ground as possible for proper handling, but design restrictions often cause it to be higher.

There are many kits available in the automotive aftermarket that allow you to lower your car. *Don't do it!* I have yet to see one of these kits that didn't restrict suspension travel. The result is constant bottoming of the suspension, excessive wear of suspension parts, and resultant loss of vehicle control.

One way to safely lower the center of gravity of your car is to use some of the new low-profile tires of the 60 or even lower 50 series. Not only are these tires smaller in diameter, but they are wider. This gives more tire/road contact, allowing for more cornering force.

The lifting kits are just as dangerous as the lowering kits. These kits significantly raise the height of the center of gravity, reduce the car's cornering ability, and adversely affect the handling. And, worst of all, *they expose the gas tank to any vehicle ramming your car from behind* (Fig. 7).

Fig. 7 Exposed gas tank — A BAD idea.

SPRUNG AND UNSPRUNG WEIGHT

While total weight of the vehicle is of great concern, so are two other types of weight; sprung and unsprung. The prime objective of the suspension designer is to reduce unsprung weight.

Wheels, and all that move with them (tires, brakes, suspension components, shocks), constitute unsprung weight. The remainder of the car is sprung weight. Since it is easier to hold the tires in contact with the roadway with lighter suspension components, designers naturally try to reduce the unsprung weight. The lighter weight also reduces the wear on suspension parts.

One way to reduce unsprung weight is through the use of alloy wheels. These are often of aluminum or magnesium alloy. However, many of the custom "mag" wheels on the market are, in fact, heavier than the original-equipment pressed-steel wheels they are intended to replace.

Part II of this series will discuss the performance of suspensions during acceleration, deceleration, and cornering; also, suspension modifications for road and track. ●

THE BACKYARD MECHANIC PART III

The why and how of a back-yard oil change and lube job

Now that you know your way around your home "auto shop" and your car—you may want to change the crankcase oil and lubricate your car. These are, without a doubt, among the most productive and easily accomplished auto maintenance jobs the back-yard mechanic can perform. You can do a complete oil change and lube at home for half the usual cost. The complete job should take less than an hour, and requires only a few items you may already have.

By doing the work yourself, you can also avoid the hassle of making an appointment, and waiting for your car at a service station. In addition, you'll feel good knowing the job is done thoroughly and correctly, and that you didn't pay an exorbitant rate for the filter, oil, and minimal labor involved.

WHY CHANGE?

Modern engine oil is miraculous stuff; when used properly and changed regularly it can work wonders in your car's engine. What constitutes "regularly," however, is a somewhat debated subject. Most auto manufacturers recommend oil changes every 6,000, miles or every 3,000 miles during extreme use. DRIVER agrees with many experts, however, who feel this may be stretching or "thinning" the oil a bit.

The old saying used to be, "Oil doesn't wear out—it just gets dirty and needs to be replaced." This is still true to a large degree, but today's low-pressure, low-emission engines operate at higher temperatures, and the abundance of air conditioning and other power options coupled with excessive high-speed and stop-and-go driving places the oil under additional stress. The oil can also be thinned by gasoline and water, and the protective additives can evaporate. The excessive heat, contamination, and evaporation make frequent oil changes more important than ever, especially on new cars.

The products illustrated in this story are not necessarily endorsed by DRIVER or

HOW OFTEN?

You can't hurt your engine by changing the oil too often—this is certain. And there is a lot of evidence supplied by professional racers and mechanics, as well as happy car owners with long-lasting engines, which indicates frequent changes are the key to long and trouble-free engine life. DRIVER therefore recommends changing the oil *and filter* every 3,000 miles for maximum engine protection. Longer intervals or less frequent filter changes may be acceptable to maintain a new car warranty—but, since you will be buying your oil and filters at discount prices as well as saving the labor cost of an oil change, you can easily afford the increased engine protection.

OIL AND FILTERS

If you've always had your oil changes done at the local service station, you may be a bit confused on the subject of oil and oil filters. The place to buy oil is the Base Exchange or other discount store. The top-quality oil which you may pay up to a dollar a quart for at a service station costs less than half that at a discount store. Many stores also sell oil by the case at even greater savings. The same is true of filters. Most discount stores regularly stock top-name filters at half or even a third of the price you would pay at a service station. Also, oil and filters are frequently placed on sale, so

All motor oils are labeled to show their qualities or service recommendations. Pre-1971 cars should use oil certified at least SD (Service Deluxe). New cars require SE (Service Extreme) oil. Premium quality oils are certified both SD and SE, so they will provide the best service for all cars.

Few items are required for a complete oil change and lube. Besides oil and a new filter—you need only a small grease gun, an oil pour spout or can opener and small funnel, and a wrench to loosen the drain plug. Filters should be hand tightened, only —but they sometimes get too tight, and a filter wrench is helpful in loosening them.

watch the ads and stock up on these items when the price is right. Then you'll have everything you need when you're ready to change the oil, and you'll save a bundle over the long run.

OIL QUALITY

Quality is the most important consideration when choosing an engine oil. All oil cans are labeled with a code which indicates the oil's service recommendation. For pre-1971 cars you should use an oil certified at least SD (Service Deluxe). New cars require SE (Service Extreme)-certified oil. Most high-quality oils are certified both SD and SE, however, so this shouldn't present a problem. Any premium quality oil will provide the required engine protection, so what brand of oil you use is mainly personal preference. It is a good idea, however, to continue using the oil regularly used in your engine, since oil additives differ from brand to brand. But if you decide to switch brands for any reason, pick a widely available premium-quality SD or SE-certified oil and stick with it.

VISCOSITY

Another big difference between oils is weight, or viscosity (flow characteristics). The viscosity of the oil you should use depends on the driving conditions. The multi-viscosity oils, 10W30, 10W40, and even 10W50 (the "W" designating oil for winter use) have become quite popular and are widely recommended for their protection over a broad temperature range. DRIVER feels a 10W40 variety is a good choice for year-around use under normal conditions. A lighter weight oil is often needed in extremely cold climates, or a heavy-weight, single-grade oil may be recommended in some circumstances. Your owner's manual explains this, and gives temperature requirements for using single-grade oils.

GUARANTEE
STP CORPORATION UNCONDITIONALLY GUARANTEES THIS FILTER.
IT MEETS OR EXCEEDS ALL LISTED AMERICAN AUTOMOBILE MANUFACTURERS ORIGINAL EQUIPMENT AND/OR WARRANTY SPECIFICATIONS.

Use only filters certified to meet all manufacturers' warranty requirements—this assures you of the filter's quality. To protect a new-car warranty, clip the certificate from the filter box and keep it with a complete record of the oil changes.

Flushing out a dirty engine before changing oil is great for keeping oil clean. The inexpensive canned flush is easy to use, and is recommended for engines which have accumulated sludge and gunk on the inside.

FILTERS

All quality filters are essentially the same—but be sure the filter you buy is certified to meet all manufacturers' warranty requirements. Several companies have recently developed special, double-stage, heavy-duty filters. DRIVER has seen this type filter

continued

Check the standard transmission and differential fluid levels by removing the plugs located on the side or back of the housings. If the car is sitting level, the fluid should at least be even with the bottom of the hole. Your manual gives lubricant specifications.

continued

THE BACK-YARD MECHANIC

in wide use on high-performance engines. And since these filters are generally not much more expensive than popular single stage filters—they may be well worth the money.

ADDITIVES

A subject that always comes up when discussing engine oils is the use of additives. Several of these oil "fortifiers" have been widely advertised. The true value of these products is not quite so well known, if at all. A recent study by a consumer-oriented research group, however, indicated these products do work as advertised—but the study concluded your engine doesn't really need them if you use a high-quality oil and change it regularly. There is also the possibility of a voided warranty if such a product is in use when a certain type of engine failure occurs.

WARRANTY

One final question you may have before performing your own oil change is, "Will it void my new-car warranty?" The answer is definitely "No," provided you use oil and filters certified to meet warranty requirements, and follow the prescribed maintenance schedule. Keep a complete record of when you changed oil—what oil was used, and clip the warranty certificate from the filter box. If this record is kept, there should be no question in event of a warranty claim.

GET READY

In addition to a new filter and the proper quantity of oil (your owner's manual will give the quart capacity of your engine), you'll need only a few more items to perform an oil change. You may need a can of engine flush, if the oil on the dipstick is excessively dirty, and you'll need a container for the used oil. You can buy a drip pan for less than a dollar, but an old plastic bucket or other container will work just as well. The drip pan will slide under the car more easily, however, if you decide to change oil without putting the car up on stands or ramps.

"Now they tell me."

CORRECTION

The statement in "The Back-Yard Mechanic," column 2, page 23, Jan '73 DRIVER, that reads: "For a complete rundown on basic hand tools, see Part 7, 'YOU, the Mechanic!' (Sep '72 DRIVER)," should read: ". . . (Sep '71 DRIVER)." A Sep '72 issue was not published. Our regrets.

You'll need a wrench to open the drain plug; on most cars an open-end or crescent wrench will do, but you may need a socket wrench for a car with a recessed drain plug. You may also need a filter wrench. The last item you'll need is a can opener and small funnel, or an oil pour spout that punctures the can. Spouts like those used at a service station are inexpensive and handy. Now you're all set for an oil change.

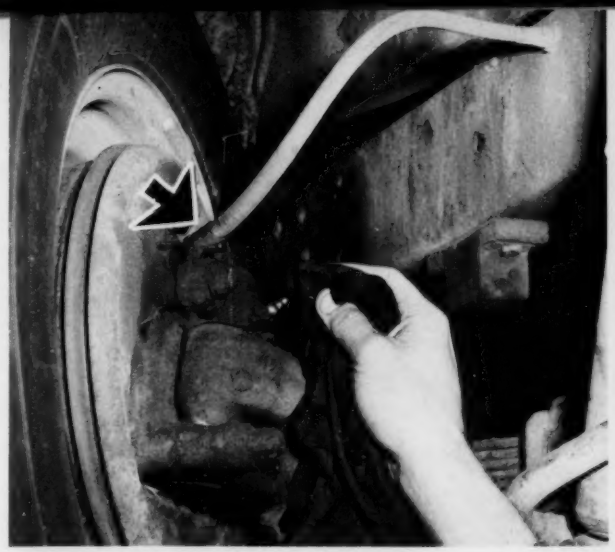
CLEAN YOUR ENGINE

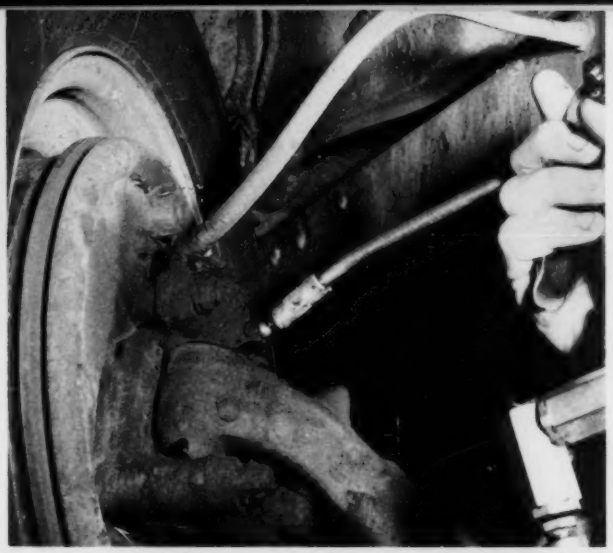
One final matter to consider before draining your oil is—how dirty does the oil get between changes? Some engines, especially on older cars, get cruddy on the inside—and when oil is added, it gets dirty immediately. The purpose of changing oil is to drain out dirt and contaminants, and add clean oil. If the new oil quickly picks up dirt, you're really not doing your engine much good. If you have a dirty engine, it's a good idea to use a can of engine flush, following the easy instructions on the can before draining the old oil.

DOING THE JOB

Lay out everything you'll need, including your tools, and a couple of rags or some paper towels for wiping spilled oil and greasy hands. Run the engine until it reaches operating temperature—this allows the oil to circulate and pick up the contaminants you want to drain out.

Carefully jack up the car's front-





Lube old-style ball joints, after wiping the grease fitting clean, by pumping lube into the joint until clean grease oozes out. Wipe the excess from around the joint. Sealed ball joints should be filled with lube until they just begin to expand. Overdoing it will ruin the seal, and the joint will run dry. The solid grease plugs on sealed joints should be reinstalled immediately after lubing. Replacing these plugs with permanent grease fittings is not recommended.

end and place it securely on jack stands. But, first set the parking brake and chock the rear wheels. Or drive it onto your ramps. If the car is on ramps, you should also chock the front wheels to prevent any movement. Lay a sheet of cardboard under the oil pan and position the drip pan under the drain plug. Loosen the drain plug with a wrench. Screw the plug out by hand until the last thread is about to let go. Then give it a quick, final turn and pull it and your hand away from the hot oil which will flow out.

While the oil runs out, check underneath the car for some of the inspection items mentioned in last month's "Back-Yard Mechanic." Look for any fluid leakage around the bottom of the radiator and transmission oil pan, at the rear axle, and at the insides of all four wheels. Inspect the brake lines and suspension system carefully.

When most of the oil is drained out, remove the oil filter. The filter cartridge should be loose enough that you can remove it by hand. If not, use a filter wrench, or drive a punch or large nail through the filter and use it for leverage to break the cartridge loose. The oil filter will contain oil, so be sure there is a pan under it.

With the filter removed, the drain plug out and the ignition off, turn the crankshaft over *a couple of times* with the starter or an extension hand starter to work the last drops of oil out of the crankcase (the engine will be ruined if you operate it without oil). While the final bit of oil drips out, you can check the fluid levels.

FLUID LEVELS

The manual transmission and differential (rear axle) fluid levels can be checked by unscrewing the plugs located at the back or side of the housings. Some of these plugs are designed to be opened with a special wrench, but a ½-inch drive ratchet will do the trick on the square-hole plugs. Insert the drive into the plug and twist it loose. If the plug is so tight that it might damage the ratchet drive, get the proper wrench or have the levels checked at a service station. The fluid levels should be at least even with the bottom of the plug holes when the car is sitting level; if the front-end is blocked up, the lube should seep out when you loosen the plugs. Have the levels topped off at a service station if they are low. This operation requires a special lubricant syringe that facilitates getting the heavy lubricant into the casings.

CHASSIS LUBE

If you own one of the new lubricated-for-life cars, or a car with an extended lube period (30,000 to 40,000 miles), it probably wouldn't pay you to invest in lube equipment. However, if you own a pre-1970 car, or more than one vehicle, you can save a considerable sum by investing in a small grease gun (under $6), and doing your own lubes. Check your owner's manual for the required lubrication frequency and for a lube chart.

Most new cars utilize sealed ball joints which require a different lubing procedure than the old-style joints. These joints should be filled by removing the solid grease plug and using a grease gun with a special rubber tip. Fill the joint until you feel it expand—overdoing it will ruin the seal. If you don't have a rubber tip adapter for your grease gun, screw a regular grease fitting into the hole to add lube. Replace the solid plug immediately—a regular grease fitting may not retain the pressures developed in a sealed joint, and it may run dry. However, this job cannot be done on a ramp; the wheels should be hanging free when the joints are lubed.

Lubing an older car takes a little more time. Pre-1970 cars may have 10 or more grease fittings scattered throughout the front-end and drive train. Check a lube chart (if it's available) for all the required lube spots on your car. If you don't have a lube chart—you'll just have to look closely for all the fittings. Older cars should

continued

After all the oil is drained out, replace the drain plug, wipe the filter seat (shown) clean, and spin the new filter on. Fill the crankcase with the proper quantity of oil—idle the engine for a few seconds to allow the new filter to absorb oil, and check the dipstick to be sure the oil is up to the proper level. Operate the engine at fast idle for a few minutes, and check for leaks at the filter—filter gaskets don't always seal correctly. Check the car over, and tighten nuts and bolts on the underside. Now you can further emulate a high-class service station job by lubing the distributor cam, putting a drop of light machine oil in the generator/alternator oil receptacle, vacuuming the inside of the car, and washing the windshield, windows, and light lenses.

continued

be lubed, after wiping the fitting clean, by snapping the grease gun nozzle onto the fitting and pumping the lube into the joint until clean grease oozes out. To keep it from collecting dirt, be sure to wipe the excess grease from the outside of the fitting.

FINISH THE JOB

After hitting all the lube spots, clean the oil pan drain plug threads, and gasket (if it has one), and install the plug. Tighten it snugly with a wrench. Apply a light film of engine oil to the filter gasket. Wipe the filter seat (at the engine) clean, and be sure the old gasket is not sticking to the seat. Start the threads carefully, and spin the new filter on until the turning gets harder. Give the filter another half turn to seal the gasket. Don't wrench the filter on any tighter —this may distort the gasket and cause a leak.

Fill the crankcase with the proper amount of oil, and idle the engine for a few seconds to allow the new filter to absorb oil. Check the dipstick to make sure the oil is up to the proper level. Then fast-idle it for a few minutes—switch the engine off and check for leaks at the filter. The filter gasket doesn't always seal correctly.

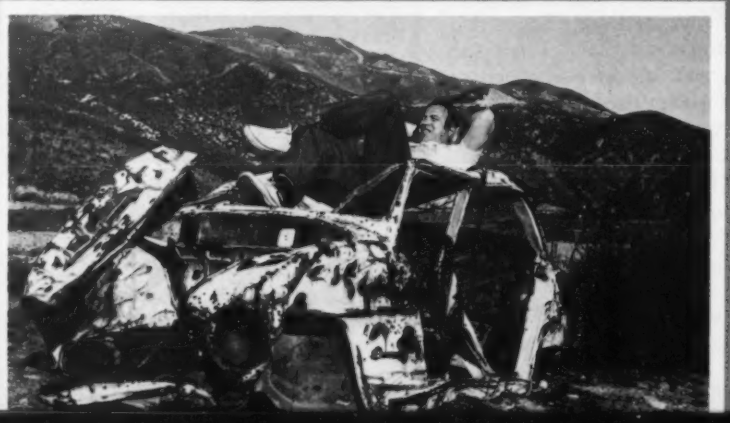
NOT QUITE YET

Before putting everything away, take a couple of extra minutes to put on some final touches that will really outdo a service station job. Some cars call for lubrication of such parts as steering-arms stops, transmission linkage, distributor, latches and hinges, and parking brake cable. Check your manual for these items. This is also a good time to inspect some of the important items mentioned in last month's "Back-Yard Mechanic" article if you haven't already done so.

One final bit of preventive maintenance that's likely to save you some trouble is tightening nuts and bolts from one end of the car to the other. Give special attention to tightening the oil and automatic transmission pans—these bolts frequently work loose and account for most of the liquid splotches you find under your car.●

WHAT ABOUT THE MESS?

Now you've finally finished—except for one thing. You're left holding the bag, so to speak—well, really, the bucket . . . of dirty oil. There are several things you can do with this fluid mess, but we feel one of the best solutions is to pour the oil into a sealable container (such as a plastic bottle), cap it tightly and take it to a service station for disposal. ●



continued from page 7

THE RADIAL REVOLUTION

WHAT TIRE IS BEST?

You may now be, if you weren't previously, convinced that the radial is a lot of tire. In fact, there's no doubt that a quality radial is basically better, overall, than any other tire available—still, under certain circumstances, it may not be the best tire for your car.

DRIVER would not discourage anyone from buying radials; we published this article to convince those needing radials to get them. But, while radials can save you money in the long run, the initial cost may be prohibitive; a good set will cost you at least $200. Spending all your dough on a set of tires you may not really need, and neglecting everything else on your car because the tires broke you, is a bad idea.

HOW TO DECIDE

The important thing about buying tires is choosing the tire that best fits your needs and billfold. There's really no point in buying a lot more tire than you need. Neither is it very wise to buy less tire than you should have. Deciding what quality tire to get is often difficult because of the many different types, makes, and grades on the market—and prices which range from $20 to more than $100 a tire. To help you decide how much tire you need, we have included a tire buyer's quiz on this page.

LONG-RANGE SAVINGS

The guide, along with the advice of a reputable tire dealer, should lead you to the tire best suited to your means and needs. If you decide you want radials, *and can afford them*, don't skimp on quality. A poorly made radial may not be as good as a conventional tire. Also, don't let the high price of a good set scare you away. As previously stated, a good radial will save you money in the long run. A recent study by the B. F. Goodrich Tire Division showed the high-quality radial to be the least expensive tire on a cost-per-mile basis. It costs only about $1.20 to drive 1,000 miles on a set of radials, as compared to $1.30 to drive the same distance on belted tires, and as much as $1.85 for conventional bias-ply tires. So, no matter what kind of driving you'll be doing, *if you plan to keep your car for the next 50,000 miles or more*, you probably will be money ahead, and a lot safer with a good set of radials.

BUYING TIRES

Deciding well in advance which tire you want can save you a lot of money; then you can price different brands of tires at several shops, and even wait for a tire sale. Most tire shops, department stores, and discount houses place certain tires on sale on a regular schedule. You can also take advantage of blemish sales, or sales on discontinued tires. You don't have to worry when purchasing "blems" or discounted tire lines from a reputable shop, since all tires sold must meet Federal Standards.

BRANDS?

Don't get hung up on tire brands. Any claims made by a manufacturer may be difficult to prove. Again, your best bet is to shop for the best tire per-dollar-value, and buy from a reputable shop.

Don't overlook the money-saving deals offered by some shops, such as free lifetime rotation and balancing. These features often offset the higher initial price you may pay. Also, don't forget the discount you can get from your base hobby shop or exchange. Private testing firms frequently publish tire evaluations in consumer magazines and guides, which may be well worth looking at before you decide on the "best" tire value.

Another important point to consider when looking for the best tire deal is that nearly all U.S. tires are manufactured by 14 major tire companies. Department store or service station brands manufactured by a major company may be less expensive, and carry an even better guarantee than the same tire sold under the manufacturer's trademark. Although such tires may be made to slightly different specifications, it's unlikely they would differ significantly—because of the Federal Standards.

MANUFACTURERS' CODES

The dealer should be glad to tell you who made the off-brand tire he's trying to lay on you—if not, check the manufacturer's code letters, the first two letters on the inside sidewall, against the list above and determine this for yourself.*

Take a close look at the guarantee when shopping for the best tire value. The specifics of the guarantee can mean an awful lot of dough in case you do have tire trouble before the warranty runs out. ●

**See "It Pays to Be Sure," page 25, July '72 DRIVER, for detailed info concerning the new DOT tire coding system.*

QUICK QUIZ

This short quiz adapted from one published by the Firestone Tire and Rubber Co. can give you a good picture of the tire you need.

Add the point total of these six questions.

1. **How fast do you drive?** Seldom over 60 (2 points), mostly over 60 (3 points).

2. **How often on rough roads?** Seldom (1 point), frequently (2 points), mostly (3 points).

3. **How often with a heavy load?** (Two or more adult passengers, heavy cargo, or both). Seldom (1 point), frequently (2 points), mostly (3 points).

4. **How many more miles will you drive this car?** (Multiply the miles per year by the number of years you'll keep the car.) 10,000 or less (1 point), 25,000 or less (2 points), 40,000 or more (3 points).

5. **What kind of driver are you?** Easy (1 point), average (2 points), hard (3 points).

If your point total is fewer than 9, you can use a bias-ply tire in the lower price range. 10 to 13 points should lead you to a belted tire, or at least a high-performance bias-ply. If you racked up over 14 points, you'd better get into a radial, or at least a top-quality belted tire.

PARTIAL LIST OF TIRE MANUFACTURERS' CODES

AA thru AH	General
AJ thru AP & LH thru LU	Uniroyal
AV	Seiberling
BA thru BP	B. F. Goodrich
BW thru BY	Gates
CA thru CC	Mohawk
CE thru CH & CV	Armstrong
CM thru CU	Continental
DA thru DU	Dunlop
EH thru EP	Bridgestone
FF thru HP	Michelin
HX thru HY	Dayton
JA thru LF	Lee
MA thru PF	Goodyear
PH thru UN	Kelly-Springfield (Goodyear)
UP thru UT	Cooper
VA thru WJ	Firestone
XA thru XT	Pirelli

Intelligent Motorcycling

PART VIII

Bill Kaysing continues his discussion of

SAFETY IN THE COUNTRY

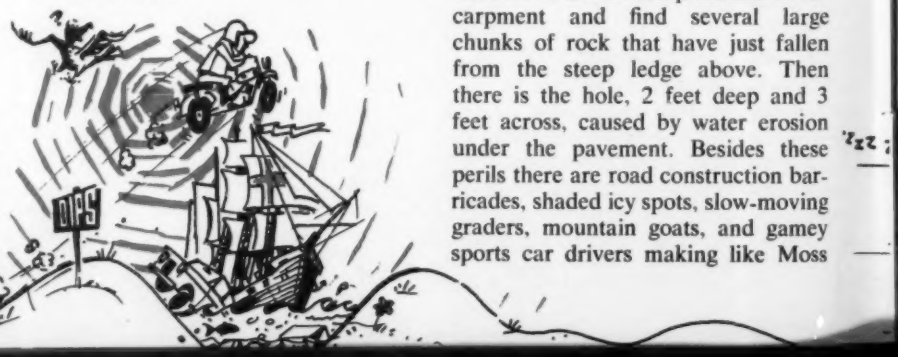
Many experienced cycle riders use special techniques for both left- and right-hand curves, particularly where visibility is obstructed by trees or hills. The rider approaching a *left-hand* curve stays on the extreme right side of the road until the curve starts. He can then see more of the curve area, and can avoid the car that sometimes wanders over the centerline. When approaching a *right-hand* curve, he will stay close to the center in order to survey the curve before entering it. This maneuver will also allow for avoiding that occasional auto parked or stalled on the turn. Both techniques allow the rider to "straighten out" the curve somewhat, thus permitting a more-or-less vertical ride across an oil slick; also, to avoid the perimeter of the curve which is the collecting place for gravel, sand, and oil. (See "Don't 'Blow It' on a Corner," p. 10, Feb '72 DRIVER.)

SKIDS

When you find yourself skidding in loose gravel, sand, or grease on a curve, keep the front wheel pointed as straight as possible. Keep the power turned on slightly to aid rear-wheel traction, and leave the brakes alone until the machine is under control. Braking with either front or rear brake on loose material or a slippery substance is a standing invitation to slide out. "Brake slides" are used in racing where the rider performs a direction-changing slide by hard braking plus a steep-bank angle. One important difference, though—the racer has special flat boots or a steel shoe, and is ready to lay it down. The average motorcyclist should never attempt this cornering method, especially on concrete or asphalt road surfaces, since ordinary shoe leather just won't slide. And there is the chance of catching your heel on a protruding bit of granite. Therefore, the street rider must rely on his ability to ride "feet up" at all times.

AIRBORNE CYCLES

Dips, which occur frequently and unexpectedly on country roads, should be approached with caution. Modern motorcycles reach high speeds with such alacrity and silence that it is easy to forget *they will also become airborne* under certain circumstances. While the really bad dips have been engineered out of most roads, there are still many others left to trap the unwary rider. In a region of repeated dips, the rider should slow down. After all, a dip may contain something . . . a stalled car, a carton, rocks, or 2 feet of water . . . that you cannot see until you are at the edge looking down. By then, at any speed of consequence, it may be too late to avoid collision.



At high speed it is possible to be launched a few inches or more when leaving the opposite side of a dip. This free-floating sensation is wonderful, but the first reaction of a novice rider is to brake—and this is not good. If the brake is applied while a cycle is in the air, the tire grabs a handful of road and a violent braking action results as soon as it touches the road surface again. This event, coupled with a slightly cocked front wheel, could cause a crash. If you find yourself off the ground after going over a rise, leave the brakes alone. Keep the throttle at about the same position, slide back on the seat, and pull up slightly on the bars to keep the front wheel up—then your rear wheel will touch down again as lightly as the proverbial feather.

MOUNTAIN MEANDERS

Riding your motorcycle in areas where the roads are edged by steep slopes and cliffs requires extra attention. You can sweep around an escarpment and find several large chunks of rock that have just fallen from the steep ledge above. Then there is the hole, 2 feet deep and 3 feet across, caused by water erosion under the pavement. Besides these perils there are road construction barricades, shaded icy spots, slow-moving graders, mountain goats, and gamey sports car drivers making like Moss

and using both sides of the road. The best overall rule for cliff country is to reduce speed until you are out—all in one piece.

STREAMS AND RIVERS

A rural road will sometimes ford a small stream or river. Unless the water is shallow and clear enough to see what's at the bottom, stop and find out if it is safe. If you have any doubt, find another crossing. Even though you may not mind getting wet, your engine block won't forgive a chilly dousing. Attempts to ride quickly through even shallow streams may result in loss of control, since there's no way of knowing what odd-shaped boulders or off-angle channels are concealed beneath the surface.

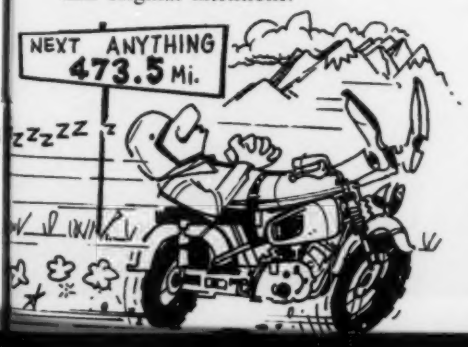
WOODS AND FORESTS

Wooded areas sometimes contain an abundance of wildlife . . . deer, elk, and moose, plus many smaller animals, so maintain a sharp lookout and be ready to stop.

While riding between thick stands of trees your eyes will become accustomed to the relatively dim light. Then, as you emerge from the gloom and enter brightly lit patches of clearing, you may be momentarily blinded. These areas of alternating darkness and brightness sometimes occur swiftly, and the rider's eyes have little chance to adjust. Since many adverse events can occur in the milliseconds involved, rotate the throttle clockwise and slow down until you can see clearly.

DEADLY MONOTONY

Travel on the prairies, plains, and deserts of the middle and far west can become monotonous. Most riders have had the experience of beginning a cycle trip across the flatlands, determined to maintain a consistent and prudent speed. Then, after hours of steady riding, they find the speedometer needle has climbed unnoticed until they are traveling at a clip all out of proportion to road conditions and original intentions.



The sensible thing to do is to stop once in awhile; preferably at regular intervals . . . say every 50 minutes, for a 5- or 10-minute break. In this way the rider becomes adjusted to a safe, steady pace across the vast reaches rather than an ever-faster trip to the "undiscovered country." In agricultural regions farm machinery is a special hazard. The wheeled goodies that our farmer friends use just won't cut it on the drag strip. Watch out for them creeping out of fields, and try not to overestimate their speed as you overtake them. Most will be moving very slowly compared to the speed of the motorcycle and should display an orange triangle to the rear. They are full of all kinds of rods, wheels, and steel teeth, so do be careful.

SPECIAL HAZARDS

The white-painted beehives are a familiar sight alongside many rural roads. Give them a wide berth, because there may be a number of bees coming or going, and the chances of accidentally intercepting one or two are quite good. If one lands on you, don't panic or attempt to brush him off. It's too easy to ride off the road or swerve into the other lane . . . just pull to a halt and attend to it while safely sationary.

Inclement weather can add a few problems. Rain is probably the greatest single weather factor in cycle accidents, and works against the rider in many ways; it

- lessens visibility,
- hinders the use of goggles, shields, and other vision-protecting devices,
- increases the possibility of spills,
- causes discomfort, and lessens attentiveness.

There are probably only three ways a cyclist can cope with rainy days; stay home, drive a car, or ride with the mental attitude that you are traveling on a sheet of oil-coated glass, covered here and there by large patches of greased BBs. This attitude should help give you the sensitivity of immediate response and precise control necessary to stay up on rain-slick pavement.

But, rain-swept rural macadam is a picnic compared to the hackle-raising hazards of icy pavement. Although it is popular with some cyclists, riding on icy country roads is more foolish than fun. You can ride like Jim Redman and still not notice that patch of ice in the shade on a turn. Even riding slowly doesn't always ensure a safe passage over the ice; an uncontrollable skid can start at any time.

Slowing down at sundown is even more necessary for a cyclist than for his four-wheeled friends. Cycle riding at night on country roads, especially those which are unfamiliar, is a test of all the skill, intelligence, and experience that a rider can muster. For a motorcyclist to ride "beyond his lights" is suicide. A motorcycle weighing less than 500 pounds, and storing much less in the "foot-pounds-of-energy" department, will usually come out second-best in a collision with a multi-ton vehicle. And, nocturnal strollers, both two- and four-legged, are other nightmares, particularly since many cycle riders stay quite close to the right-hand side of the road.

SPEED IN THE COUNTRY

Speed, alone, causes few problems. In fact, a motorcycle traveling at high speed has great stability (stability being a linear function of speed). Anyone who has ridden in deep sand knows that a greater velocity gives greater control. However, there is one serious drawback to high speed . . . the time in which a rider must take positive action to avoid a hazard becomes shorter as speed is increased.

A cyclist doubling his speed increases his risk about 3½ times. The conclusion to be drawn here is clear: keep your speed within reasonable limits and extend your riding career indefinitely. This is not stated to encourage "old-lady" type riding wherein you risk tickets for going too slowly on a turnpike or freeway. Quite the contrary, it is stated to encourage the less-experienced riders to stay well within their skill and experience limits, and to remind the old timers to allow a little more margin for errors and the unexpected.

So tour the beautiful countryside on your motorcycle and have fun, but always ride within your own limitations, those of your cycle, and the limitations imposed by the road, traffic, visibility, and weather. ●

Editor's Note: In our next installment, Bill Kaysing discusses "Safety Off the Road.")

Adapted from CYCLE WORLD. Permission from Bill Kaysing and the Parkhurst Publishing Co. gratefully acknowledged.

What Should You Do ?

CONTEST WINNERS

The response to our November '72 "What Should You Do?" Contest was outstanding both in the number of entries received and the quality of the answers. A total of 76 entries listed answers ranging in number from 5 to 37. Quite a few discrepancies were uncovered that had been missed by our staff. Some readers even went so far as to question the idea of driving a convertible under any conditions without a roll bar, especially on a freeway. Others went into great detail about what was wrong in the inside rearview mirror scene.

We selected the photograph for this feature because so many built-in discrepancies left little for us to do. However, we did make the following "alterations":

(1) pasted an unrelated and reversed scene on the inside rearview mirror;

(2) removed the entire upper portion of the lamppost near the freeway sign; and

(3) reversed the direction of the lamp on the nearest lamppost.

(4) removed the outside rearview mirrors from the pickup truck;

(5) removed the driver from the car in front of the pickup;

(6) moved the rpm needle to an inappropriate rpm for the indicated speed of travel;

(7) reversed the labeling of the fuel and oil gages;

This was *all* we did to the photograph.

Our "Grand Champions" in this contest are:

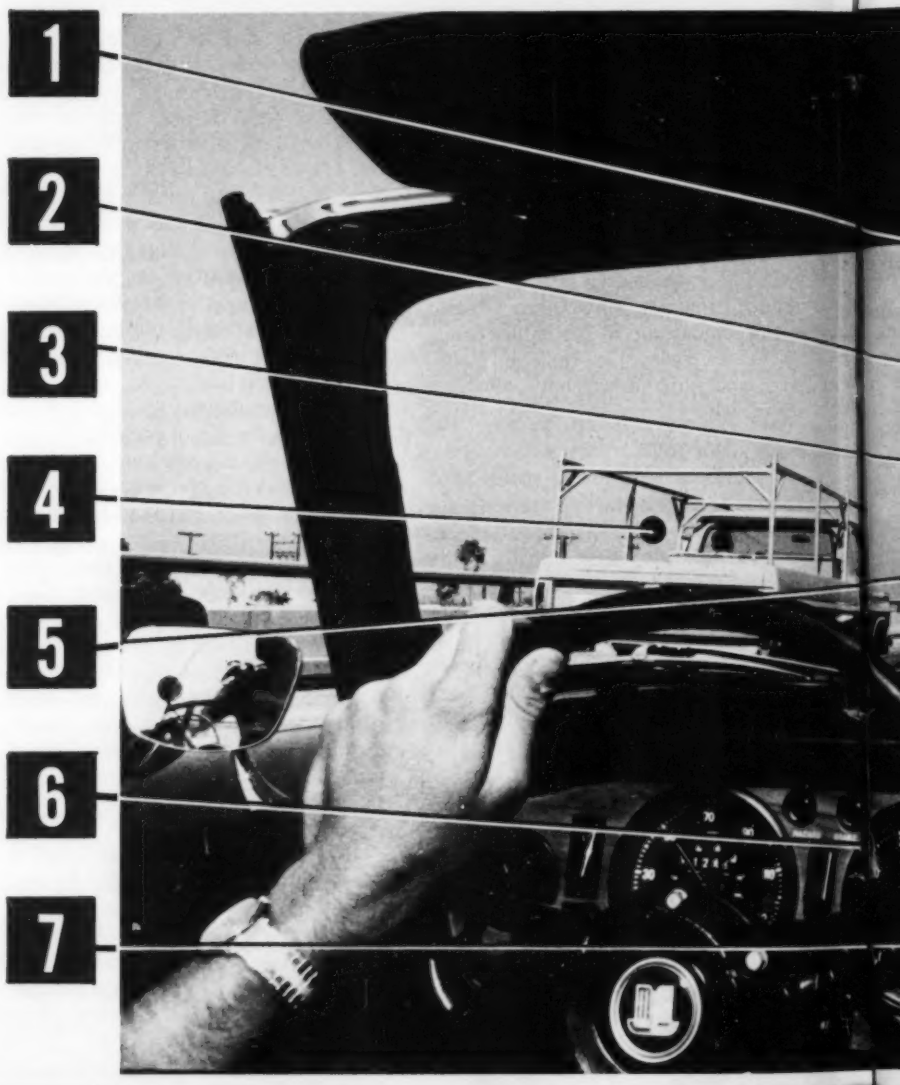
Sergeant Philip B. Henry III, 6924th Security Squadron, APO San Francisco 96386, and

Captain Joseph N. Cupurdija, Headquarters AFSC (IGU), Andrews AFB, Wash. DC.

Both men identified an equal number of what we consider to be the most valid discrepancies. Sergeant Henry and Captain Cupurdija each correctly identified 14 discrepancies.

Authors of other outstanding entries are also listed.

Below are the 15 original discrepancies and unsafe practices noted by



the DRIVER staff. Numbers 16 through 22 are the ones uncovered by our readership, and which we feel are valid:

(1) Most vehicles shown are tailgating for the indicated speed shown of 50 mph;
(2) driver has one hand on steering wheel;
(3) motorcyclist on left is "splitting" traffic lanes;
(4) wrong scene on inside rearview mirror;
(5) fuel and oil-pressure gage labels are reversed;
(6) no oil pressure;
(7) inappropriate rpm is indicated for speed of travel;
(8) engine temperature is running hot;
(9) no outside rearview mirrors on pickup truck;
(10) no driver in vehicle in front of pickup;
(11) semitruck in front of driverless vehicle is in wrong lane for freeway driving;
(12) lamppost near freeway sign has no lamp;
(13) lamppost immediately behind is suspended over edge of freeway;
(14) motorcyclist to the right is not wearing helmet or protective clothing;
(15) two cars are squeezing together on the freeway access ramp to the right;
(16) motorcyclist to the right is too far left of the center of his lane;
(17) motorcyclist to the left is not wearing adequate protective clothing;
(18) the same motorcyclist has an emblem attached to his windscreen which could possibly restrict his view;
(19) the driver ahead has glasses hanging on his rearview mirror;
(20) the Ford Falcon in front of the unhelmeted motorcyclist appears to have a broken left brakelight lens;
(21) our driver's ashtray is open to the wind, perhaps resulting in the "piece of dirt" in his eye; and
(22) the steering wheel of the driverless car should be visible from this angle, so is missing.

We really have to hand it to you readers, many of you are real "eagle eyes." DRIVER hopes you will use this highly developed skill of thoughtful observation every time you drive. A sharp-eyed approach will pay BIG dividends in better driving and fewer accidents. Thank you for participating in our contest. •

RUNNERS-UP

(All with a score of 13)

A1C Dennis L. Kruse
K. I. Sawyer AFB, Mich.

SSgt James H. McElwee
60 Supply Squadron (LGSIR)
Travis AFB, Calif.

MSgt James Scoggins
1605 Air Base Group (AD)
APO New York 09406

Gordon Lau/Dan Lubecki (Joint Effort)
U. S. Coast Guard Air Station
Corpus Christi, Tex.

About Miss DRIVER (see back cover)

Green-eyed Susan Palmer was born in Wichita, Kansas, and now lives in Rialto, California. Susan was the first female to enter a state junior college basketball game. The 18-year-old blonde is a Phys Ed major and on the basketball team at San Bernardino Valley College, and holds the 1972 title of "Miss Rialto." Susan's activities besides basketball, include volleyball, horseback riding, skydiving, snow skiing, bowling, softball, modeling, and bicycle riding. She told DRIVER about recently being nearly hit by a car while walking. It has made her super-careful now, when she walks or drives.

BACKFIRE

Address your letters to:
Editor
DRIVER Magazine
AFISC/SEDD
Norton AFB CA 92409

DON'T BURN YOUR HANDS

In DRIVER's Dec '72 ". . . Emergency Tool Kit," you recommended releasing the pressure by raising the tab on the radiator cap, then removing the cap after covering it with a cloth. . . . It doesn't take long to cook a hand, even through several layers of cloth. One way to prevent this problem is to install a coolant recovery system. . . .

Then, to clear a clogged fuel system, you advised placing a hand over the carburetor . . . . A poor-running engine can backfire through the carb and result in a burned hand. . . .

PN3 Derek Bobo
FTG, Box 55C
FPO New York 09593

With the pressure released, cap removal should be safe—if you're careful (we recommended this as an emergency procedure). Instructions for installing a coolant recovery system appeared in May '71 DRIVER. Re the hand-on-the-carb procedure; let the engine cool, leave the ignition off, and turn the crankshaft with an extension starter; if you're in a hurry, and the engine is hot, cover the carb with a piece of cardboard.

PINS CAN SLIP

Re "The Back-Yard Mechanic," Jan '73 DRIVER, under the subhead: "SAFETY STAND ESSENTIAL." I have safety stands and use them regularly.

A note of caution—*watch out for the pins; they tend to slip out when you slide the stands in and out.* Suggest wrapping a rubber band around the small end of the pins after setting them in place.

Maj John N. Eastberg
3902 Greystone Drive
Austin TX 78731

Thank you, Major. This could prevent a serious or fatal accident.

WHY?

DRIVER's Dec '72 "Give Your Car a Clean Bill-of-Health" was very interesting and informative. But why is it necessary to take your car to a diagnostic center in the first place? . . . Why don't they make them stronger and better—right now, not 20 to 50 years from now? . . .

If you can use any part of this in getting us better cars please feel free to do so. . . .

SSgt George A. Moody
PSC 1161
APO New York 09289

Sorry we didn't have space for your entire letter, or for the list of ailing parts, causes of breakdowns, and your recommended correctionary measures. The Federal Government is quite active in motivating vehicle manufacturers and parts/components makers to comply with fair practices and advertising laws, as well as with Federal Standards, so the situation should be getting progressively better. Meanwhile, we'll keep giving you tips on how to get safer and greater mileage from what's currently available.

TIME IT RIGHT

The static timing procedure in DRIVER's Jan '73 "Tip of the Month" could cause trouble for a novice unless he first rotates the crankshaft until the mark on the vibration damper lines up with the appropriate timing mark. Also, the rotor should point to Nr 1 pickup in the distributor; if not, the crankshaft should be rotated 180 degrees (although not necessary, timing on Nr 1 makes the procedure more easily understood). And, since the distributor can be rotated several degrees while the test light remains on, a more exact setting can be attained by rotating the distributor until the light goes out, then reversing it until the light just comes on.

CMSgt Louis Steffens
Hq ADC (LGMWA)
Ent AFB CO 80912

You are quite right, Sarge; the timing marks should be first aligned. We were remiss in assuming a novice would determine from the article or the manual that the timing marks must be aligned to time the ignition. Thanks, also, for refining the instructions to include rotating the distributor and reversing it to get a more exact setting.

UNDER THE HOOD

Tell your readers to *NEVER use anything but approved windshield washer fluid in their windshield wash bottles!*

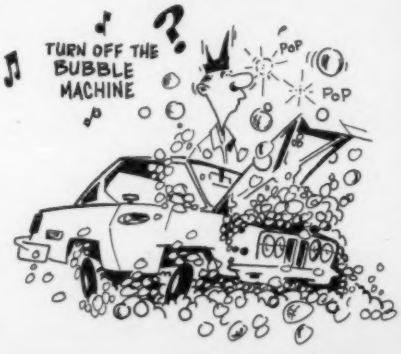
I used a small amount of *dishwashing liquid* in mine and, after I drove about 100 miles, the engine died. I raised the hood and found the engine compartment full of . . . would you believe soap suds? The heat and vibration had produced enough suds to wash the dinner dishes, and had shorted out the ignition.

I could have been in bad trouble in heavy traffic, but all I got was delayed and irritated at myself. I thought I'd pass this on to others who might have similar "bright" ideas.

That's all—keep DRIVER coming; it's the only sensible automotive publication I've seen yet.

Sgt Thomas Caceci
5500 Fontana Place
North Springfield VA 22151

Thanks for the tip; it could very well prevent others from becoming so embarrassed and/or endangered. ●



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CAPTION CONTEST

GOT A FUNNY CAPTION FOR THIS PHOTO? SEND IT TO US, WE'LL PRINT THE 10 BEST.

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"Sorry, sir, but I'll have to see your driver's license first. . . !"

"Why couldn't you buy a used bread truck like the rest of your buddies?"

Miss DRIVER

"I check my car's lights regularly to see if they are working properly, and if a bulb needs to be replaced I do it myself. To take off most lenses and get at the bulbs, all you need is a small Phillips-head screwdriver. While you have the lens off, it often helps to clean the reflector with a soft cloth. It's amazing how much dirt accumulates behind lenses, especially around the taillights. Some bulbs are reached through the trunk, but it is usually easy to figure out how to get at any light, and worth your time to check each one periodically."*

** See Part II, "Back Yard Mechanic," p. 22, Feb '73 DRIVER, for procedure to replace seal-beam lights.*

SUSAN PALMER